

Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

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The fact that the Boston & Maine falls far short of earning its dividend of 7 per cent. during the last fiscal year has its rich hue of irony in its bearing on the suspended merger with the New Haven. When the latter corporation a year and a half ago traded some 110,000 of its own shares for the same number of shares of the Boston & Maine, held by large stockholders, the explicit plan was to let the minor stockholders come in on the same terms. In fact, just then, or a little later, its new shares were put in the New Haven's treasury for that express purpose. Then came in Massachusetts what may be alliteratively described as the outbreak of passion, prejudice and politics. The merger was held up and now at

the end of a year and a half there is an endless tangle of lawsuits; Boston & Maine shares are in the Boston market at this writing 15 points below those of the New Haven—127 as compared with 142—where at the outset of the proposed merger the two stocks were at substantial parity; the big stockholders who exchanged have drawn their eight per cent. dividend, while the minor and outstanding stockholders have had but seven per cent. and that more contingent hereafter than the New Haven's 8; the Boston & Maine's much-needed improvements have been held up along with the merger; and, finally, President Mellen and the New Haven corporation at the slight cost of \$110,000 a year in the new dividend requirement have had substantially all the vantages of the merger without its responsibility and with moral absolution from continuing the exchange of shares. Such is the present result of the impact of demagogism and politics in a New England state upon a logical and businesslike railroad transaction, which could have been adjusted by the slightest exercise of popular common sense. If the people opposing the merger had desired to play right into the New Haven's hand, they could hardly have been more successful.

On a hot and stuffy afternoon in July nothing is more effective in giving one's parlor a really chic appearance than to have a nice striped linen cover on each chair and sofa; especially if the covers can be bound with red braid and each chair-back be decorated with a two-dollar hand-embroidered monogram. Indeed, a certain degree of style or smartness is almost necessary to comfort, when the weather is oppressive. But the application of Mr. Louis Ochs to have this aid to happiness made compulsory on all the passenger cars running in the state of Louisiana has come to grief. The railroad commissioners of the state received his petition, called on the railroad managers to appear at their office on the 21st of July, and solemnly "sat" on the question; but they found that the linen would cost from \$267 to \$518 a car, to say nothing of care and washing, and they reached the cold-hearted decision that the expense was not warranted. They actually took note of the fact that the railroads' incomes had been poor the last 10 months. How these commissioners can face their constituents at the next election is a question that we should hate to have to answer. Mr. Ochs is the representative of the "T. P. A.," which means, we suppose, the True Patriots of America; and every true patriot in Louisiana will wish to replace these unfeeling commissioners with men who will be more sensitive to the will of the people.

NEXT YEAR'S M. C. B. COMMITTEES.

The secretary of the Master Car Builders' Association has issued the lists of committees for the convention of 1909, and they were printed in our issue of August 14, page 737. From the list of subjects that are presented the meeting promises to be of great value, and if reports are rendered on all of the topics much original investigation will have to be done before next May. Notice is also given in the instructions to committees of a change in the method of procedure in the presentation of papers that will not only effect a great saving in time but will avoid straining the mental faculties of the audience beyond the limit of elasticity, as the late M. N. Forney would have said. Heretofore the members have been obliged to listen to the verbatim reading of all reports, regardless of their length, by the chairmen of the committees. The readers' enunciation has not always been of the clearest and the penetrating qualities of their voices were frequently unequal to the requirements of the distance to be covered. The result has often been wearisome to the listeners and more loss of time. This is to be changed; all reports of special and standing committees will be read in abstract only. In order that they may be printed and distributed in advance of the meeting, they must be in the hands of

the secretary in time to be printed and issued by May 1. All of which will make for the good of the association and avoid that crowding out of important matters on the program because of lack of time, as so often occurs, and which was the occasion of so much regret at the last meeting.

Regarding the standing committees that have reports to make, little need be said. Their work is perennial and goes on from year to year because of the exigencies of car service and the requirements of a modern practice that is in progress of development. Probably the one subject that is most in the public eye is that of Car Wheels, which might more properly be called Cast Iron Wheels. The attacks that have been made upon and the defense that has been made for this article as applied to the high capacity cars have attracted a great deal of attention during the past two years and the subject will certainly be much more alive in the future than in the past, especially if it is taken up by the daily papers. Opinions are divided; yet few railroad men would feel warranted in making a public statement to the effect that cast iron wheels are unsafe for this work, though admitting that those in use are a constant source of uneasiness. The problem before this standing committee, therefore, is to make some recommendation as to the service that can be safely expected and the kind of wheel that will give a maximum of efficiency.

Among the special committees there are a few that have been on duty before and have been reappointed to meet new conditions or have been continued because of a past inability to do the work required of them within the time available. Of the latter, that on side bearings and center plates is one of the most noteworthy. It will be remembered that at the last convention this committee reported that "there is evidence that derailments have in many instances resulted from the use of side bearings carrying too great a proportion of the load when used with rigid underframes and from the binding of improperly constructed center plates and side bearings which causes the wheel flanges to crowd and climb the rail." The committee then recommended that an investigation be made in order to determine the effects of the various forms of side bearings, that are in use, upon the action of the wheels and the movement of the cars on curves; and until such an investigation is made it was suggested that no change be made in the present M. C. B. center plate.

If an appropriation be made for this purpose and if the work is done with the thoroughness that usually characterizes that of the association, there will certainly be made a notable addition to our present knowledge of railroad dynamics, when the report is published.

Another committee dealing with an item important in the economical maintenance of cars is that on air-brake hose. What is wanted is something that can be used and abused most outrageously; a hose that can dangle along and hit every switch rail at 40 miles an hour; that can be bent double and folded flat; that will be as flexible with the thermometer at 40 deg. below as at 100 deg. above the zero mark; that is so thoroughly protected that no stone bruise can affect the inner lining; that can be stretched over any coupling nipple and that is of such a low cost that it won't pay to repair it or even take care of it. It is hardly likely that these specifications will be met before the next convention, but some experimental work has been done that indicates that it is quite possible to make a decided improvement in the durability of hose under present service conditions, and that kinking may be nearly if not wholly avoided. It is probably along such a line of improvement as this that the committee will work.

Another report that should furnish a needed light for a dark corner is that on the protective painting of steel cars. This is a matter exceedingly difficult to solve, especially if it is carried on to include the interior of cars intended for the transportation of coal that contains a high percentage of sulphur, and the underframing of refrigerator cars that

are exposed to the action of salt water drippings. Here, too, there is need of a long and painstaking investigation, and it is hardly probable that a definite conclusion can be reached in the short time available. Still it may be possible to do enough, before that time, to indicate on what lines future work should be planned.

It is somewhat anomalous that while the laws of the land make the rules for the protection of trainmen very rigid as regards going between cars for the coupling of the draft gear there is nothing to guard against the necessity of entering that dangerous ground to connect the air, signal and steam hose. To be sure the cars are always in motion in the first case and always at rest in the second, but there is more or less peril involved, nevertheless. The matter was reported on and discussed at the last meeting but owing to differences of opinion, no decision was reached as to the type of connector that should be used for these hose couplings, the parties being divided between the advocates of the side and those of the face openings. It is, of course, of great importance that there should be a uniformity of practice in this particular, and it is to be hoped that something can be done, during the present year, to bring this about.

While it cannot be said that any of the subjects, upon which committees are scheduled to report, are unimportant, those indicated are the ones most prominently before the railroads for consideration and settlement; and if any one of the problems so presented can be definitely solved, the year will have much in the way of an achievement to its credit.

THE TICKET AGENT.

The dull, cross, ignorant, ill-bred ticket seller still flourishes in the land, if we may believe our correspondent, L. L. M., and the ex-cowboy whom he quotes; and we are asked to explain the reason. In former years one could make a 500-mile journey and find *all* the ticket agents and many of the conductors perfect brutes, or sufficiently near that condition to spoil the pleasure of his journey. One agent that we recall, who flourished "before the war," kept in his office a ten-foot pole with which to rap the heads of passengers who were unusually obstreperous. Conductors who had to eject drunken passengers without much regard to their feelings sometimes had so much of that work to do that they carelessly applied rough treatment to decent passengers. And it seems that ungentlemanly railroad men are not all dead. For ourselves we have of late years found civility, if not politeness, quite general; though we confess that our observations have not been sufficiently extended to warrant us in broadly disputing our correspondent and his cowboy friend. Whatever difference there may be in detail, however, there is no question of the need of a great improvement. The essential difference between a ticket seller and a grocery clerk is still observable in hundreds of stations. The ticket seller is not surely 873 million times a year, for many of those passengers have season tickets; but if he is lacking in politeness once a day in each office, the superintendent has an important duty in connection with the matter.

The first underlying cause is the same as that which leads railroads to spend much more time and money on the comfortableness and beauty of passenger cars than on station buildings. The passenger spends 20 times as much time in the car as at the station, and it has seemed reasonable to give 20 times as much attention to his needs or desires. There are many well-bred people to whose houses a visitor will be admitted by a poorly trained servant, making a very unfavorable impression, who yet will see that the visitor is well treated once he is inside. A scant allowance being granted for station expenses, the agent is usually overworked and underpaid. This is the cause of the dullness which we have set down as his first fault. The second, "cross" behavior, is caused by this dull ticket seller coming in contact with

an unreasonable passenger. The third fault is ignorance. In consequence of this the agent who is cross to the unreasonable passenger, and perhaps praises himself for having taught the passenger a needed lesson, continues his brusque behavior to a dozen innocent passengers before he bethinks himself and straightens his face. In addition to these faults we have called the offending ticket agent "ill-bred" because railroads have tolerated him through successive generations, and have taken insufficient pains either to improve him themselves or to supplant him by employing a different set of men, who have been well-bred before they enter the railroad service.

No railroad presumes to justify itself for this bad management, of course. One reason that our "campaign of reform" has not touched the matter is the smallness of the separate grievances and the consequent difficulty of dealing with them. A man with a 25-cent claim for overcharge on freight can have the earnest and intelligent aid of a \$10,000 commissioner at Washington (or a \$15,000 man at Albany) in formulating and presenting his case, and he need do nothing himself but write a brief letter; but the man who has missed a train, and lost a half-day or a day because the ticket agent did not try to give the best possible answers to passengers' questions, very likely will pocket his loss rather than try to show up the agent's blunder or neglect. Maybe the fault is only general slowness and inefficiency, which the passenger could not prove, anyway. A fault for which there is any shadow of excuse is likely, when complained of, to elicit from the G P A a letter devoted more to defenses than to apologies, and this further discourages the complaining passenger.

Railroad superintendents know how to secure the best service in ticket offices, and need no advice from us; but we will confide to our correspondent one or two things which appear, or ought to appear, in the superintendent's note book.

The simplest remedy for petty faults is to get rid of men with petty minds. This does not mean that college graduates can be had in all the ticket offices of the land; but that the young men who are brought up in station offices ought to be trained to extend their vision a few feet outside the ticket window. If they do not see that the necktie salesman fills his place far better than most ticket sellers fill theirs, have the facts explained to them. One reason that the store clerk does better is that failure loses him his job, while marked success means an increase in pay. Repeated neglect of politeness in a ticket seller should be detected and reprimanded. Punish simple neglect; do not wait for manifestations of pronounced incivility. Rivalry among young ticket sellers would promote good service. Five per cent. added to the ticket office payrolls, in the shape of premiums judiciously distributed, would pay well—for a year or two, at least. "Judiciously" means, however, the most careful, intelligent and impartial inspection, to the end that no one shall be able to find much fault with the awards.

Station offices are not likely to be much improved until there is a little loosening of the rule that the expenses of small stations shall be rigidly based on their incomes. To have a force of efficient men, a railroad must cultivate an esprit de corps, which may involve paying premiums to ambitious young men even at insignificant stations. The Pullman company, which in discipline can teach some things to some railroads, seems to recognize this principle; its least profitable runs are manned by well-trained men. One railroad officer to whom we have held up the Pullman example thinks that the luxurious character of the Pullman service makes it so different from ordinary passenger service that our preaching does not apply; but in what respect is the Pullman conductor a better man than the superintendent wants for conductor, station agent or ticket seller, except perhaps in the newness of his uniform?

Though still emphasizing the point that the formulation of rules is easy, and that the problem in hand is to secure the

men and to see that they heed the rules, it will not be inappropriate to again quote the circular lately issued to agents and conductors by the Delaware, Lackawanna & Western, which we do below. The significant points in this circular are the "thanks" in the first paragraph and the "wish" in the last. To carry out that wish, that men shall "fully measure up" to the ideal, involves the features that we have named: Punishment for small faults; patient instruction in fundamentals; rewards (premiums) for excellence, even at small stations; and the adoption of a Pullman standard for ordinary passenger service. This last may seem unbusinesslike, unpractical, or even extravagant; but with our present ideals we have made poor progress; why not adopt higher ones?

FROM A LACKAWANNA CIRCULAR.

The possession in marked degree of any worthy faculty should always be an incentive to develop that faculty. This company considers that its agents, conductors and other representatives possess the faculty of being courteous to the public above the average. To those who cultivate and exercise this faculty the company extends its congratulations and its thanks; to those who may not have fully appreciated its importance, thoughtful consideration of the following is suggested:

First—The principle that underlies courteous treatment of others is simply that of doing unto others as you would they should do unto you.

Second—In a highly complex and technical business such as that of the railroad there are many things that you, with your training and daily experience understand with perfect familiarity but which the public do not understand; therefore, do not assume that the public should comprehend them without asking questions, but when they make inquiry of you give them the courtesy of a reply just as full and clear as you can make it, and without any suggestion of superiority born of a greater knowledge.

Third—Words are only one means of expression and manner is quite as important; therefore, remember that a kindly and gracious manner is not only the sign and mark of a self-respecting man, but is to your words what oil is to machinery in making them move effectively to their purpose.

Fourth—True courtesy is no respecter of persons. It remembers that "a man's a man for a' that," and gives the civil word and the helping hand quite as readily to the ill-clad stranger as to an official of the company.

Fifth—Courtesy is not only something the public have a right to expect of you but *it pays*.

It pays in the friends it makes you personally and as a representative of the company.

It pays in minimizing the friction of your life, as well as that between the company and its patrons.

It pays in raising your standing with the company.

It pays in the personal satisfaction resulting from having done the right and kindly thing by your "neighbor."

It is the wish of the management of this company that all its representatives, whose work brings them into contact with the public, may appreciate and fully measure up to their duty and privilege in this respect.

BUFFALO, ROCHESTER & PITTSBURGH.

This is the first report for the fiscal year ended June 30, 1908, that has been reviewed in the *Railroad Age Gazette*. It, however, is safe to say that we shall receive very few, if any, reports showing an actual and considerable increase in the amount spent on maintenance of way, and at the same time a reduction in dividends. The Buffalo, Rochester & Pittsburgh spent \$1,625 per mile of line operated for maintenance of way in 1908, as against \$1,369 in 1907. This figure is all the more striking because the 568 miles operated includes 127 miles over which the B. R. & P. has trackage rights. A new contract, taking effect July 1, 1907, was made with the Erie, providing that the Buffalo, Rochester & Pittsburgh should maintain the joint track between Mt. Jewett, Pa., and Johnsonburg. The distance between these two places is about 22 miles, and the cost of maintaining this line may account in part for the increase in maintenance of way expenses. Improvement work was continued during the year, and \$970,000 was spent for additions and betterments. The largest single item in the construction column is \$440,000 spent for second track from Brockwayville to Carman, 11 miles, which included some tunnel work. The total mileage operated in 1908 was 568

miles, a reduction by change in alignment of a little less than a mile from the mileage operated in the previous year.

The sum of \$2,500,000 was spent during the year for new equipment, making the net increase in value of equipment \$1,980,000. Ten locomotives were added and 2,076 freight cars, while only 218 freight cars were destroyed or transferred. The policy of the company in regard to the depreciation and maintenance of equipment may be seen from the maintenance of equipment account given by the old method and that required by the Interstate Commerce Commission. The percentage of maintenance of equipment to total expenses, as shown in the old method of compiling the figures, was 15 per cent. in 1908; but when the figures were compiled according to the Interstate Commerce Commission classification, it was 21 per cent. of total expenses.

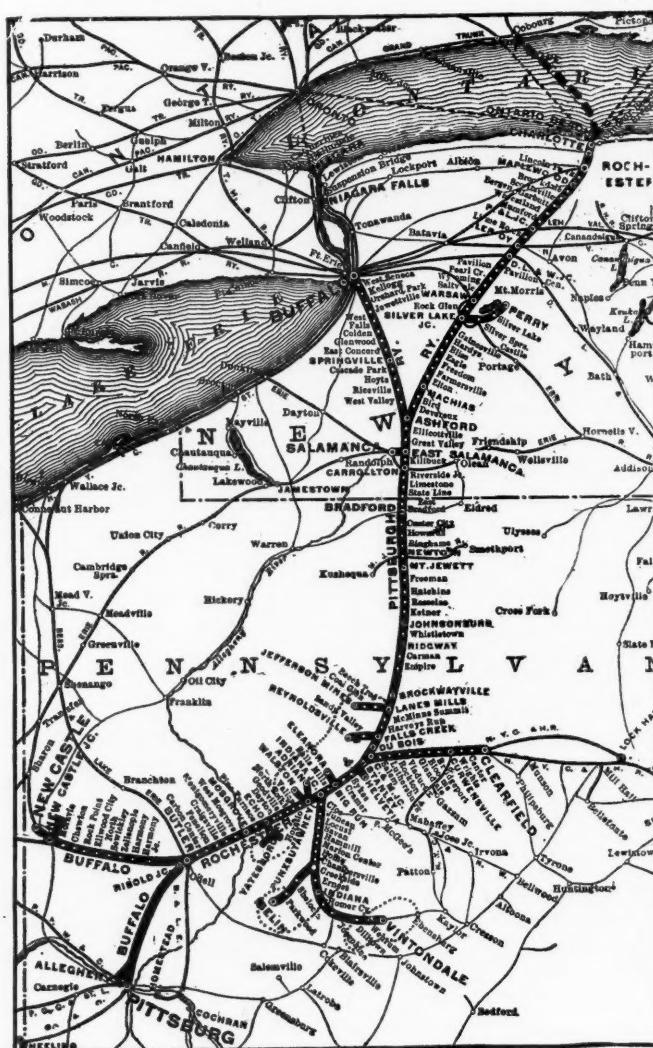
The balance sheet reflects as sound a financial policy as does the income and expense account. The \$1,000,000 one-year notes falling due in March and carried on the balance sheet as current liabilities, were paid, and \$3,000,000 consolidated mortgage bonds and \$1,065,000 equipment bonds, series F, were sold. The company had on June 30, 1908, current assets of \$2,350,000, as against \$2,000,000 current liabilities, and included in these current liabilities are \$930,000 construction and improvement notes due August 1, 1909. Cash on hand is \$1,500,000 in 1908, a decrease of \$1,900,000; but, on the other hand, payrolls and vouchers payable in July amount to \$580,000 in 1908, a decrease of over \$1,000,000 from the 1907 figure. Material on hand is valued at \$1,200,000, an increase of about 25 per cent. over the previous year.

Up to November this road, like its neighbors, was enjoying great prosperity. It is a coal carrying road, serving Pittsburgh and the two lake cities of Buffalo and Rochester, and competes with the Buffalo & Allegheny division of the Pennsylvania. In July, 1907, the B. R. & P. increased its gross receipts by one-half, as compared with a year previous, and the net was more than doubled; but by January the road was feeling the general business depression severely, and gross earnings were 14 per cent. less than in January, 1907; the decrease in net earnings, however, was only about 6 per cent. Gross earnings for the year ended June 30, 1908, were \$8,400,000, a decrease of \$260,000. Operating expenses were \$5,000,000, an increase of about \$32,000. All the foregoing as well as the following figures are compiled on the old basis, to enable comparisons to be made with the previous year. The figures given in the manner prescribed by the Interstate Commerce Commission are quite different, and a comparison with the previous year is out of the question. The amount applied to payments for interest, rentals, taxes, etc., increased by a little less than \$300,000 on account of the interest on the new consolidated mortgage bonds sold during the year and the interest and sinking fund requirements on the equipment bonds issued. Taxes which, prior to 1908, had been increasing out of all proportion to the increase in mileage operated, show a decrease in 1908 of a little over \$24,000. Freight earnings were \$7,000,000 in 1908, as against \$7,400,000 in the previous year. Last year 8,900,000 tons were carried as compared with 9,500,000 in 1907. This is a decrease of a little over 6 per cent., while the profit received per ton was \$25 in 1908 and \$29 in 1907. Passenger earnings last year were \$1,062,454, as compared with \$1,100,000 in 1907. The company estimates that it lost 5.15 cents per passenger last year, against a profit of 1.59 cents per passenger in the previous year. President Yates says that the 2-cent fare law of Pennsylvania, which went into effect October 1, 1907, has caused a reduction in earnings of about \$80,000 a year. The company is testing the constitutionality of the law in the courts.

The average trainload last year was 530 tons, a decrease of 13 tons from 1907. The average number of loaded cars in a freight train was 17, a decrease of one from the previous year. The character of the goods carried changed little.

Coal forms about two-thirds of the freight carried, and with iron ore and other products of mines forms about three-quarters of the total. The tonnage of all classes of freight decreased, with the exception of products of mines other than coal and iron ore and the products of animals. This tonnage was 470,000 tons, products of mines, in 1908, and 300,000 tons in 1907. The tonnage of products of animals was increased by about 2,000 tons, making the total tonnage in 1908 41,000 tons. Coke earnings fell off 35 per cent.

Freight car mileage balance received was \$576,000 in 1908. This is an increase of about 60 per cent. over the previous year, and reflects both the increase in the per diem rate from 25 cents to 50 cents and the increased equipment of the B. R. & P. Detail figures for maintenance of equipment are not given, but the decrease of \$5,000 in 1908 from the \$1,280,000



Buffalo, Rochester & Pittsburgh.

spent for maintenance of equipment in 1907 is easily explained by the number of new cars bought last year. The Ontario Car Ferry between Charlotte, N. Y., and Cobourg, Can., began operation in November, 1907, and notwithstanding the general depression of business, the traffic over the new route was well sustained.

The sum of \$360,000 was paid in dividends on the preferred stock and \$525,000 was paid on the common, leaving a surplus of \$138,000 transferred to profit and loss account. Since the close of the fiscal year the regular semi-annual dividend on the common stock was paid, but was reduced from 3 per cent., paid in the first half of 1908 and in 1907, to 2 per cent.

This company was in a good position to weather the panic.

but this in no way lessens the credit due the management for the way in which they have operated the road during the severe depression in business. The road now finds itself in a strong position with no necessity for extraordinary expenses for maintenance of either road or equipment. Its most apparent weak point is its rather small supply of cash.

The following table summarizes the principal operating results for the last two years:

	1908.	1907.
Mileage owned	347	348
Mileage operated	568	569
Passenger earnings	\$1,062,454	\$1,143,444
Freight earnings	7,062,193	7,382,345
Gross earnings	8,408,145	8,666,580
Maint. way and structures.	922,909	775,929
Maint. of equipment.....	1,274,537	1,279,986
Conducting transportation..	2,773,460	2,882,251
Operating expenses	5,174,013	5,142,343
Net earnings	3,234,132	3,524,238
Net income	962,662	1,435,239

NEW PUBLICATIONS.

Tests of Concrete and Reinforced Concrete Columns.—Bulletin No. 20; Series of 1907. By Prof. Arthur N. Talbot. 60 pages. The University of Illinois Engineering Experiment Station.

This bulletin records experiments which will be of value in fixing the standing of certain types of construction. One type is the column having the concrete hooped or bound with steel bands or spirals. Tests on this form reported from France and Germany indicate great strength, but the results have not been considered conclusive and many questions have been raised concerning its applicability to general construction. The tests here reported will therefore be welcomed. The tests go to show that in hooped columns the steel hooping does not come into action to any great extent before a load equivalent to the ultimate strength of plain concrete, or a little below, is reached, and that up to this point the action of the column is very like one of plain concrete. Beyond this load the column shortens rapidly and the deformation becomes very marked. The extreme amount of shortening is a great disadvantage. The amount of strength added by the hooping before ultimate failure is reached is two to three times as much as the effect of an equal amount of longitudinal reinforcement. There is a discussion of the French and German experiments, and observations on Poisson's ratio and data on the phenomena accompanying tests of plain concrete columns are given. Copies of this bulletin may be obtained from the Director, Engineering Experiment Station, Urbana, Ill.

Letters to the Editor.

DISCOURTESY OF TICKET SELLERS.

Indianapolis, August 27, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Why is it that the present agitation for reform in railroad management does not get down to particulars? Railroad officers have had deeply impressed upon their minds the importance of sparing no effort to get and keep on good terms with the public. Yet there is one personage—one that comes in contact with the public much oftener than all the officers—who has not learned this lesson, or at least has not had his manners much mended by it. I mean the numerous personage who sells tickets to passengers. Railroad officers seem still to think the manners of the station agent and ticket-seller a trifling subject for serious discussion; but the fact is quite the opposite. The ticket-seller is everywhere that the railroad is. He had dealings with the public 873,905,133 times in the twelve months ended June 30, 1907, this being the number of passengers carried by the railroads of the United States in that year. He and the train conductor were the only representatives of

the roads with whom a large proportion of the millions of persons who rode upon trains came in contact. The amiable feeling that he excited in the breasts of many of these people is perhaps aptly illustrated by a remark that is attributed to the chairman of a certain state corporation commission. The chairman, who was formerly a cowboy, observed to several railroad officers: "When we get through with your rates, we are 'going after' your station agents down here. I think I may 'shoot up' a couple of 'em myself to teach 'em some manners."

Why is the small-salaried young person who sells people railroad transportation less respectful, polite and attentive to his customers than the small-salaried young person who sells clothing or cigarettes? It is a fact, that it is much harder to get civil treatment at the average railroad ticket counter than at the average retail store counter. This is equally true in the city and in the country town. The average country station agent or city ticket-seller seems to take pleasure in unnecessarily keeping prospective purchasers of tickets waiting; and when he unavoidably keeps them waiting he usually deems it unworthy of one of his importance politely to apologize or explain. The seasoned traveler who knows just what he wants and demands it in loud and haughty tones can usually get prompt attention, but the man who meekly asks for information regarding the time of arrival or departure of his train, or the details of his routing customarily receives curt answers delivered in a churlish manner; or, perhaps, no answer at all. Here and there, of course, are ticket-sellers who realize that they are employed to serve the railroad the best they know how, and that they can best serve the railroad by treating its patrons with uniform patience and courtesy; but the proportion of men of this type is much too small.

The churlishness of its employees is always charged against the railroad. People feel that the company could make its representatives act differently if it would try. Feeling thus, they seize the first opportunity that offers to vent their indignation against it to its injury.

L. L. M.

PROPOSED IMPROVEMENTS OF THE SEABOARD AIR LINE AT TAMPA, FLA.

The Seaboard Air Line has let contracts for improvements on Crassy Island, which is just south of Tampa, Fla. The following improvements are now under way: The north side of the island adjacent to the railroad property and slip will be dredged, extending back from 1,800 ft. to 2,000 ft. On the inside side of this slip will be built a naval stores dock 50 ft. x 1,200 ft. of saw-tooth construction for handling lumber. This dock will be served in the rear by the necessary storage and distribution tracks. On the west side of the island, near the northwest corner, will be built a dock, approximately 50 ft. x 500 ft., and just back of it a storage warehouse about 75 ft. x 400 ft. In front of this proposed warehouse and dock will be a dredged berth, about 1,200 ft. long for ships. This will be back of the government channel. Further to the southward and on the west side of the island adjacent to the present government channel will be a dock, 50 ft. x 700 ft. A phosphate handling plant, with a capacity for loading approximately 300 tons per hour into ships, will be located on this dock. This will enable ships to load in about ten hours. In front of this proposed dock and phosphate handling plant a berth will allow ships to lie back in a protected area away from the present government channel. This dredged ship's berth will be about 75 ft. x 1,000 ft. This dock and phosphate handling plant, with storage tracks, will be connected to the other portion of the island improvements.

At present, the island is not connected with Tampa main land by any direct track, but work is being pushed on a connection over a steel Scherzer rolling lift bridge, 185 ft. long, center to center of bearings. Work is in progress on the foundations and steel work of this bridge. The main track connection with the island will run off the southern end of the

Tampa train yard, which gives a very desirable train movement and storage yard in connection with the island improvements. The layout is arranged with a view to future developments and increased facilities, which can be put in without interference with the above-mentioned facilities. The phosphate handling plant will be built so that its capacity can be doubled without altering to any great extent the present track layout. The water in the various slips and berths will be about 24 ft. deep at local mean low water, which is a little deeper than the present government channel, but which will be ready for the proposed government proposition for a deeper channel to the city.

The contract for the terminals has been let to Burwell & Hillyer, of Jacksonville, Fla. The superstructure of the rolling lift bridge will be erected by the Phoenix Bridge Co., of Phoenixville, Pa., and the substructure by V. M. Johns, of Portsmouth, Va. The work will be pushed vigorously, and it is hoped that the bridge will be completed in the early part of 1909, and that the other work will be finished a few months later. It is expected that the dredging will be completed within 120 days. The work will be substantial in every respect, and its design has been made with an idea of convenient handling of business. The work is in direct charge of H. S. Thomas, under the general direction of W. L. Seddon, Chief Engineer.

When these facilities are finished Tampa will have a large railroad terminal, which it has never heretofore possessed, the salient feature of which is that it is within a few minutes walk of the main business portion and banking centers of the city.

UNIT COSTS OF RAILROAD BUILDING.

Last year the Bangor & Aroostook built 28 miles of new single track, known as the Medford Cut-Off, from South Lagrange, Me., north to a point about four miles south of West Seboois. The original main line between these points is four miles longer than the new road. The old road has been double-tracked from the junction north four miles to West Seboois. The cut-off, which has a maximum southbound grade of one-half of 1 per cent., is used for southbound trains from the north to South Lagrange station, where the old and new roads come together; the old line, with a grade of 1½ per cent., is used for northbound traffic.

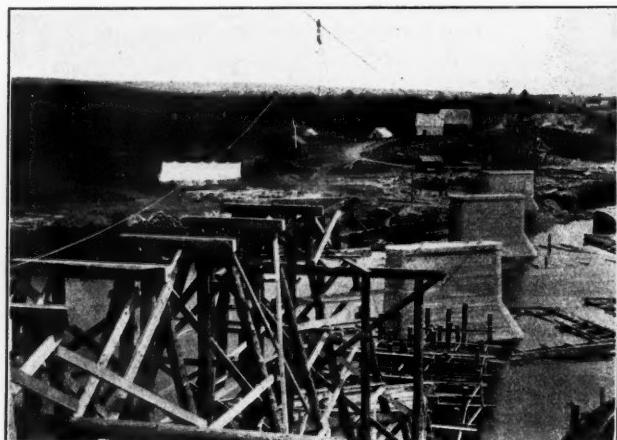
Of the accompanying photographs, three are typical views of the new cut-off while under construction. No photographs are available showing finished track on this line, so we have reproduced views taken on other stretches of single-track road recently completed, which show the same style of roadway, and therefore give a good idea of the character of the new work.

The country through which the Medford Cut-Off was built is nearly all wooded land. The northern part is heavily wooded for 16 miles, and of the southern part half is lightly wooded and half is cleared farming and grazing land. The character of the soil changes at about the same point as the character of the timber. The northern part consists of hard pan and boulders, with about two miles of bog 10 to 30 ft. deep. The southern part is sand and gravel. The earthwork was heavy. The work began in April, 1907, and was finished in December of that year.

The adverse gradients southbound are 0.5 per cent., and are short; northbound, 0.7 per cent., compensated for curvature. The curves are all 3 deg. or easier, except one of 4 deg. The rails are 85 lbs., A. S. C. E. section, with Bonzano joints. The ties are soft wood, 18 to the 33-ft. rail. Tie-plates are used on all ties on curves and on all joint ties on tangents. The bridges are designed for E-44 loading. There are five of these: two deck girder, 75 ft. and 34 ft. long; one through girder, crossing the Canadian Pacific, 82 ft. 6¾ in. long; one three-span overhead highway crossing, viaduct style, 108 ft. long, and one bridge 607 ft. 2 in. long, consisting of three spans pin connected and two spans deck girder, the lengths of the spans

being 75 ft., 151 ft. 11 in., 153 ft. 4 in., 151 ft. 11 in., and 75 ft. The piers for this bridge are shown in one of the accompanying photographs.

The cost complete of the 28 miles of road, including everything except right of way, real estate, stations, water supply



Piscataquis River Bridge; Medford Cut-Off.

Five-span bridge; concrete masonry nearly finished and temporary trestle partly erected.



Grading; Medford Cut-Off.

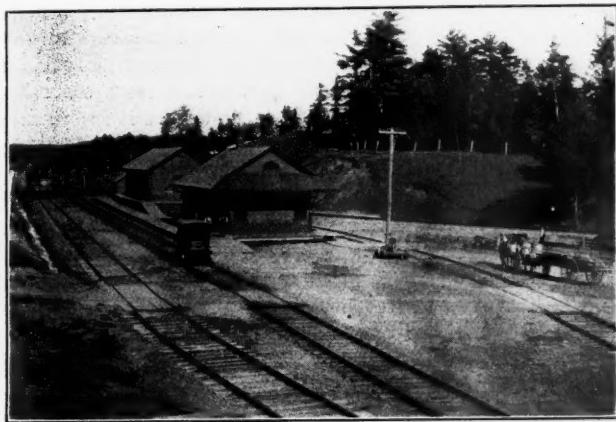
A steam-shovel cut; narrow-gage construction track and cars.



Track over Bog; Medford Cut-Off.

Track laid on a cross-laying of small trees. This carried heavy engines with trains of earth and gravel every day for two months, but gradually settled and was raised on additional layers of logs and brush and finally filled with gravel.

stations, equipment and signals, was \$950,000. This includes the cost of telegraph line, which was about \$6,400. The cost of stations and water stations was \$20,000. The cost per mile, therefore, deducting cost of telegraph line, right of way, stations, etc., was \$33,700. It should be noted that this work was done while labor prices were high.



Frankfort Station; Northern Maine Seaport Branch.



Schoodic Stream Bridge; Schoodic Stream Railroad.
Branch of the Bangor & Aroostook, built in 1906.



Northern Maine Seaport Branch.
Showing same kind of single track road as the Medford Cut-Off.

QUALIFICATIONS AND DUTIES OF THE TRAVELING ENGINEER.*

BY W. L. KELLOGG,

Master Mechanic of the Pere Marquette.

The Traveling engineer must have knowledge and the faculty of imparting it. He must have convictions and courage to prosecute them. He must have no friends, and need have but few foes. He must be energetic and still maintain a couple of suits of overclothes. He must in all cases be able and willing to set the example of his precepts. He should learn early in his career that he is not employed to make excuses for men who were cut out, and by God intended, for some other vocation besides railroading. He should be an expert, smooth and careful runner. He should be an authority on breakdowns and the mooted mysteries of the compound engine, the new valve gear and the setting of the old, the cause of brake failures and the way to prevent them. He must know the cost of materials and supplies and the best way to secure their economical use. He must be a fuel expert, a good judge of water and leave all opinions of other liquids to the politicians. In short, he should have few less requirements in his makeup than Carlton prescribes for an editor. So much for the man and a few of his multitudinous qualifications.

The instructions to the traveling engineer should be explicit, yet broad enough to meet all emergencies. He should be instructed to frame and guide sentiment, to look after and coach the firemen who are to make the future engineers. He should be instructed to look after the comfort of engineers and firemen on the road and at way terminals, so that a good and harmonious feeling will always be maintained. He should report meritorious conduct as well as the derelict and let the higher official take due action in rewarding proficiency, as well as punishing culpability thus reported.

To attempt to standardize his duties would in our estimation be a mistake. He should be considered as an assistant to the head that appoints him, which head usually knows its own weaknesses, and the duties assigned should be such as the next higher in authority cannot from lack of training or inclination properly attend to, and in this way balance the strength of the organization. There should, however, be some assigned duties. There is no more logic in allowing a traveling engineer to work at random than any other official or semi-official, yet he should not be so tied down that he has no opportunity to display his own peculiar abilities. The keynote of the answer will be found in the question itself if you will underscore the words "make himself." We are all what we make ourselves, not what others make us, and to a man given the range and latitude that usually falls to a traveling engineer the opportunity to make himself is always present.

As tutor and disciplinarian of engineers he should remember that we were all born innocent and have to learn; that to make a man is a great credit, to break one can only be justified as a painful duty. He should bear with the plodding yet safe man, yet remember it is an equal charity to rid the service of a dangerous one. As an inspector of equipment and work he should early learn that which any official should know, namely, he cannot do it all himself, and his value will depend on his ability to command the co-operation of engineers in seeing and reporting the defects that he would see if he were always there, and their insisting on the work being done for them as he would insist on it being done for him.

His mechanical training should have taught him the value of lubrication as an aid in the application of power and he should draw a close parallel between power as concerns energy and power as concerns authority. Nothing moves without applied power. Well lubricated machines or bodies move with minimum resistance. Friction in the machinery or friction among the men is often the result of power misapplied. An

*From an address before the Detroit convention of the Traveling Engineers' Association.

additional notch in the quadrant will force more steam through the cylinders and sometimes get you over the hill, just as you can force a man to do an unpleasant duty, but in an indifferent manner. If a few additional drops of oil through the lubricator or a few pleasantly spoken words will accomplish the same results you will have saved coal and machinery or the good will of a man, and the "esprit de corps" is the cream of an organization.

The science of railroading is the art of making things go smoothly, economically and on time. Nothing succeeds at haphazard. Select a man who is qualified to perform the peculiar duties that the service may stand in need of; assign him work that will take a reasonable percentage of his time to accomplish; systematize this portion of his work, but leave him some opportunity to develop along his own lines; vest him with all the authority needed; require brief yet complete reports of his work; insist on absolute loyalty to the company, but do not require him to be a "special agent."

The traveling engineer should never be made from his division, and it might be better if there was an exchange made with a nearby system, the reasons for which will probably be admitted without argument. Officials would do well to send their traveling engineers out occasionally on other lines to make observations and if one is unable to absorb some good ideas from the poorest managed piece of railroad in the world, he is incompetent. Not one of us must get the idea that our road is perfect, or even the best, and the best will never be good enough. We must gather it in by observation, talking, arguing and reading a portion at least of the great mass of available knowledge as published by our mechanical papers.

A traveling engineer should make elaborate and accurate tests and be able at all times to give an intelligent reply to his superior on mechanical appliances such as injectors, lubricators, pops, brakes, etc.; also on materials, brasses, white metal, jacket iron and brake shoes. He should be able to furnish data and make intelligent argument in favor of, or against, engines, cars, wrecking appliances and the various component parts when his company is in the market for such equipment or parts. He should be called in consultation and be able to suggest the necessary changes from his notebook to make each time card a better time card. He should be an assistant, not a "knocker." If he spends his time telling what he would do were he master mechanic or superintendent of motive power, the chances are he will never be able to reach the point where a demonstration will be possible, although if his selection was made on merit and his ambition rightly directed there is no reason why he should not obtain one of these positions. And right here I would like to give you an axiom to follow: "Fix the cause and then the effect." If, for instance, on your division you break a driving axle, out of several hundred, the break is not uncommon or unheard of; but you should record the circumstance. Later on a second or third breaks. Your notes tell you that the conditions are similar, same kind of engine and other similar conditions. It is now time for the traveling engineer to get busy and find out the weights carried in comparison with other equipment, the character of service, the kind of material, the comparative size and any other influencing factors. This diagnosis will usually show the cause. If the cause is not fixed, and if out of your jurisdiction, you will be on record and have an opportunity of saying, "I told you so," which you enjoy so much when your wife makes this remark early in the morning when you have had mishaps needless to mention.

The traveling engineer should be in comparison like a huge sponge, able to absorb all he comes in contact with. If he cannot learn from the humblest wiper or truck builder, or the various classes with whom he has to deal he has mistaken his calling. These items of detail he must gather and segregate and compare until he is able to say this or that is the best method of practice. The traveling engineer should make indicator, fuel and other tests and report to the master mechanic,

who usually accepts them without verification. He must be a close observer and take a live interest in economy; be an organizer, keep his men happy and properly keyed up to the requirements. He should be a believer in recognition as well as reward for good service rendered.

Let us dwell for a moment on the necessity of mental labor by our younger employees which must be stimulated and rightly directed. We often find young men willing workers in physical lines who are mentally paralyzed and who never read of the exploits, experiments and perplexing problems which have been worked out by past generations, the results of which should be in his library and much of it in his mind. The traveling engineer has the opportunity to enforce this mental culture.

The traveling engineer should take up the matter of waste—unnecessary popping, engines blowing and all things in general, and be able to illustrate its cost in the aggregate. The traveling engineer, above all other things, should preach and talk caution. His motto should be: "Better behind time at a terminal than ahead of time into eternity." These are days of high speed, probably in all walks of life. It is both expensive and dangerous. Much has been said and written along the above lines and the handling of locomotives drawing our friends and families, but the greatest advancement must come through the medium of that personal interest that every engineman and officer must have if he is desirous of increasing his ability and sphere of usefulness. If men are not thus inclined, they should be weeded out early in the game. Some few men have less judgment than the ordinary cow. You will know them because their chief interest centers on reaching terminals and pay day. If the traveling engineer finds them and picks them out, he will have at least accomplished the much desired end of having a good personnel, which is all that is required to meet all emergencies and accomplish all deserved ends on any railroad.

MOVABLE COAL CHUTES ON THE LOUISVILLE & NASHVILLE.

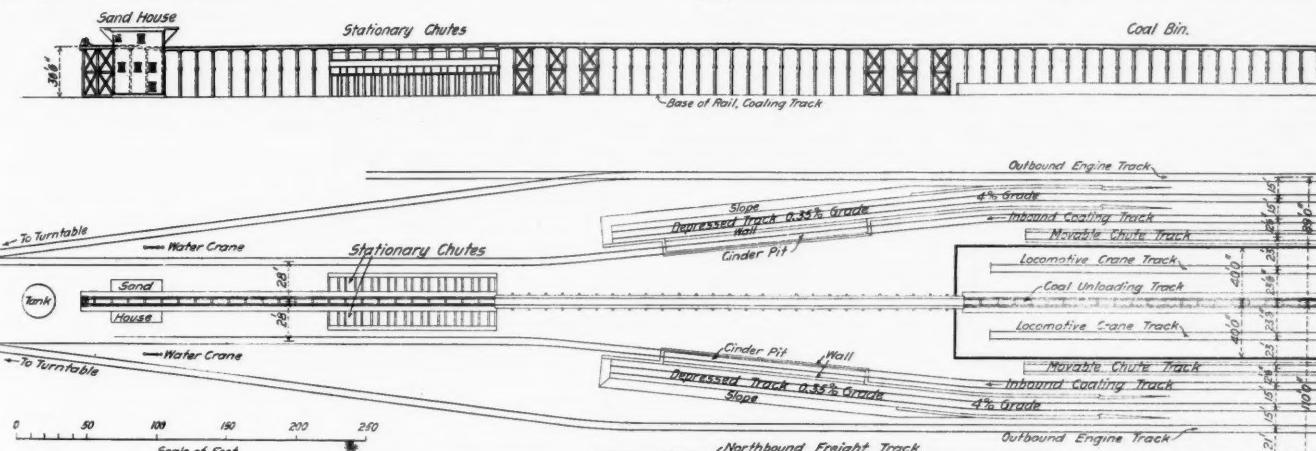
At the last convention of the American Railway Engineering and Maintenance of Way Association, during the discussion of the committee report on coaling stations, reference was made by R. Montfort, Consulting Engineer of the Louisville & Nashville, to a method of coaling by movable chutes used on his road. It was evident from the questions which followed that a portion of the members, at least, were not familiar with this method of coaling. We therefore asked Mr. Montfort for drawings and information covering the road's practice in this respect and present them herewith.

A typical plan for one of these plants is shown. It consists of a coal bin about 80 ft. wide and 600 ft. long with sides about 8 ft. high, the capacity being about 20,000 tons. Through the middle of the bin is a trestle for filling the bin from side or bottom dump coal cars. In the bin, on each side of the trestle, is a track for a locomotive crane with grab bucket; and outside of the bin, on each side, is a track for a movable chute. The standard movable chute has four pockets of eight tons capacity each. These chutes are also made sometimes with pockets of different capacities, one or two holding perhaps eight tons, and the others holding five and three tons, respectively.

The standard chute shown in the drawings is 27 ft. 4 in. high, 28 ft. 3 in. long and 9-ft. gage. It is mounted on 33-in. cast iron car wheels, there being three pairs spaced 10 ft. 7½ in. on centers. The doors and aprons of the pockets are equipped with fixtures made by Williams, White & Co., Moline, Ill. The arrangement is such that when the counterbalanced apron is pulled down the door opens automatically. When closed, the aprons and counterbalance arms do not project beyond the face of the pocket. The standard chutes cost about \$500 each, or \$125 a pocket. The chutes are sometimes built

with more than four pockets, the cost per pocket being the same. The standard coaling plant of this type is also provided with a stationary chute beyond the bin and movable chute, which is also served by the elevated trestle supplying the bin. Coal may be dumped from the cars directly into the pockets of these chutes.

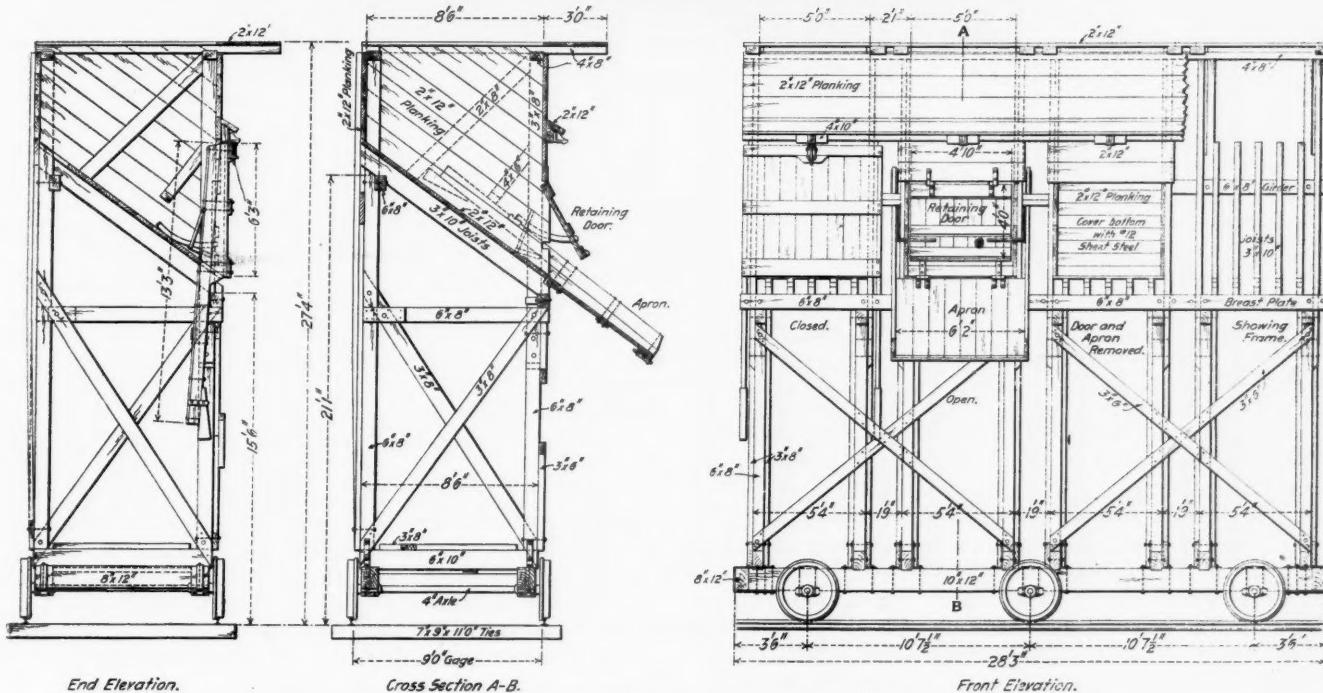
The practice with these plants is to fill the bin during a period of the year when all of the rolling stock is not needed for revenue traffic. During the same period, while cars are being used to haul coal for the company, the coaling is done from the stationary chutes, saving rehandling. When the equipment is withdrawn from company coal traffic the stored



Plan and Elevation of Boyles, Ala., Coalizing Plant.



Eight-Pocket Movable Coal Chute; Louisville & Nashville.



Standard Movable Coal Chute; Louisville & Nashville.

coal is used. The locomotive cranes begin at one end of the bin, and, as they advance, the movable chutes are kept abreast, saving travel for the cranes. These cranes are usually of 10 tons capacity, with grab buckets of 1½ or 2 yds. capacity. The boom has a reach of 24 ft. with a height under the bucket of 29 ft. when elevated. The cost of handling coal with these cranes is about 5 cents a ton. Between the rails for the movable chutes is a standard gage track, on which cars may be loaded by the cranes for supplying the stationary pockets from the bin, should this become necessary.

The Louisville & Nashville has been using this type of coaling station for a great many years, the first one having been installed in July, 1890. This was at Guthrie, Ky., on the Henderson division. At present there are plants at South Louisville, Ky., and Lebanon Junction; Nashville, Tenn., and Columbia, and Boyles, Ala., and New Decatur. In the plant at Columbia the coaling crane runs on the elevated trestle. During the fiscal year 1906-07 there were 252,777 tons of coal received and 248,900 tons issued at Boyles; 144,919 tons received and 120,852 issued at Lebanon Junction, and 173,868 tons received and 156,052 issued at South Louisville.

THE TRAVELING ENGINEERS' CONVENTION.

The sixteenth annual convention of the Traveling Engineers' Association was held at the Cadillac Hotel, Detroit, Mich., August 25 to 28, inclusive. President A. M. Bickel (L. S. & M.S.) was in the chair. Following an address of welcome by George T. Moody, president of the Detroit Board of Commerce; D. R. McBain, Assistant Superintendent of Motive Power of the Michigan Central, addressed the convention, giving the members some good advice. Complimenting the association on what it had accomplished already, he said:

"In order that further improvement may be accomplished, we will have to keep moving. 'No lethargy' must be the watchword! Good, intelligent, conscientious effort is the keynote to the success we must win. An occasional 'jolt' to remind us of what we can and ought to do is good for us. * * * That resolution to do better is the spirit that wins success, and consciousness of honest success, no matter how humble, has old shoes beaten a mile for solid comfort and sound sleep. * * * The road foreman of engines must not be narrow-minded nor vindictive; these traits produce more headaches and bad dreams than anything else. * * * The little difficulties and occasional failures in one thing or another, if rightly looked upon, are good for us—keep us in mind of ourselves—from soaring too high. * * * In these strenuous 'big stick' times it behoves us as representative men in our departments to do something to heal the 'lacerations' on the backs of our respective corporations; or, if we cannot heal the wounds, we can, at least, help the victims bear the pain until the reformers have finished reforming."

The president then delivered his address. Commenting in detail on some of the subjects for committee report, he said in regard to the one entitled "In What Manner Can the Road Foreman of Engines Best Assist in Increasing Net Earnings?" that in the present era of drastic anti-railroad legislation he firmly believed the road foremen should be instructed by their superiors to take a lively interest in political matters, especially in the selection of legislators and members of Congress, at all times having the interests of the employing corporations in mind, as it is well known that when the railroads are prosperous the country at large is prosperous. * * * Undoubtedly road foremen of engines can do more to increase the net earnings than they have been doing. The wholesale waste of coal should receive close attention. Road foremen of engines should be given authority to see that the coal put on tenders is properly prepared, as with present day firing the firemen haven't the time to break up the coal suitably, if they are so inclined, and much waste results. Keeping grate and

flue openings free of obstructions will increase the flue mileage, but the road foremen need the co-operation of the roundhouse forces to watch this properly. The escape of steam through safety valves has been estimated to amount to from \$40,000 to \$50,000 a year on large roads in fuel wasted. This can be greatly reduced by careful watching. * * * Members were urged to devote some time to acquiring a knowledge of electrical matters and it was recommended that officers of electric roads be invited to join the association. The continued improvement of mechanical stokers was referred to and the belief expressed that the association should lend its hearty support to these efforts.

The secretary reported 87 new members for the past year, a net gain of 24. The present membership is 657—570 active, 80 associate and 7 honorary.

During the convention addresses were delivered at different times by W. L. Kellogg, Master Mechanic of the Pere Marquette; George W. Huntley, Special Representative of the Senior Vice-President of the New York Central Lines, who spoke on the proposed advance in freight rates; C. D. C. Thompson, First Assistant Weather Forecaster at Detroit, who told briefly of the forecasting of bad storms in winter and giving advance notice of the same to the railroads likely to be affected, and L. D. Gillette, Master Mechanic of the Norfolk & Western.

The officers for the ensuing year are: President, J. A. Talty, Delaware, Lackawanna & Western; First Vice-President, C. F. Richardson, St. Louis & San Francisco; Second Vice-President, F. C. Thayer, Southern Railway; Third Vice-President, W. C. Hayes, Erie; Secretary, W. O. Thompson, New York Central (re-elected); Treasurer, C. B. Conger, Chicago.

Denver, Colo., was chosen as the next place of meeting.

The first report to be considered was "How Much Territory Should a Road Foreman of Engines Cover? Over How Many Engines and Crews Should He Have Jurisdiction?"

The report declared that this depends on the density of traffic, number of engines used and condition of the power. The road foreman of engines should be able to get over his territory often and to ride each engine once a month. The good results of such practice would be plainly manifest and would mean a considerable saving to the company. The road foreman can't get results when he is spread over a territory so large as to be neither seen nor felt. He should know all of the men and be able to keep in close touch with them; he should have their confidence.

The number of crews and engines under the jurisdiction of one road foreman should be determined largely by the density of traffic. Where business is heavy on a division the road foreman can look after more crews than where they are spread over a large territory, which takes more time to reach and ride with each. On heavy traffic divisions a road foreman could look after 125 engines—175 crews—but this is a large force for one man, and would be better divided. On roads in sparsely settled districts, where the road foreman has several hundred miles of road, 90 to 100 engines is a large number, and fewer than this is better.

The road foreman, by careful watching of engines that are nearing time for repairs, can keep them in service from one to three months longer, provided the number of engines in his care isn't too large. The committee recommended that a road foreman should not be assigned more engines than he can ride once a month, nor more crews than he can supervise personally.

In the discussion, in response to a question as to what constituted "riding an engine"—how many miles—the chairman said the road foreman should ride it long enough to find out how the crew is handling it, and to discover the defects needing attention at the roundhouse, which have been reported by the crew and ignored at the terminal, requiring the road foreman to act in order to get it done. He must use his own judgment as to the distance or time to ride.

Mr. Webb (M.C.) said the road foreman of engines could be of greater help to the master mechanic than any other one person, therefore he must not have too much territory if he is going to be efficient. Mr. Corbett (M.C.) said the road foreman should be able to see his different engine crews often enough to be on a friendly footing with them so they would not be afraid of him when he rides with them. Other members testified from actual experience as to the advantage and benefit of reducing territories that had been too large.

In regard to the number of locomotives one road foreman can look after advantageously, Mr. Hogan (N. Y. C.) said one having 100 regularly assigned engines would have an easy time compared to the one having 100 pooled engines. The lack of interest of the crews in the latter makes it necessary for the road foreman to follow them to the roundhouse to see that they receive proper attention in order that the efficiency of the power is maintained; and he must have the authority to do this. Where the committee recommended 125 engines for a road foreman he thought the figure ought to be 100. Mr. Meadows (M. C.) thought even 100 too many. Mr. Talty (D. L. & W.) has 140 locomotives on 200 miles of main line. They are regularly assigned engines and he doesn't get around to the different ones oftener than once in 60 days. The road foreman has considerable correspondence to attend to, engine failures to investigate, etc., that may take up a third of his time; therefore to ride the engines every 30 days he would have to ride about five a day if he had only 100 under him. Mr. Webb (M. C.) said it was a road foreman's duty to *head off* the failures by close attention and by educating the men to report engine troubles intelligently at the terminal. Mr. Talty said that no matter how intelligent the enginemen's reports, they were too often ignored or slighted at the roundhouse until the road foreman took hold of the matter. Mr. W. G. Wallace (Am. St. Fdries.) pointed out that it wasn't necessary for the road foreman to ride with all of the men at regular intervals. Some of the men can and do handle their engines as well or better than the road foreman himself can; it is the fellows who aren't making time and pulling the tonnage. Mr. McManamy (Pere Marq.) said the territory a road foreman of engines can cover depends largely on his ability to educate his men to the point where they are efficient enough to relieve him of a great deal of his work. Road foremen must not be afraid of increased duties, for with them comes increased responsibility, increased salary perhaps, and in time, promotion.

"Terminal Tests of New Types of Locomotive Brakes to Locate Defects, and Remedies for Defects."

This report gave detailed instructions in methods for testing the new types of locomotive brakes before the engines leave their terminals. The Westinghouse No. 6 and No. 5 E T, and the New York locomotive equipment, were included, with full illustrations.

The discussion of the report consisted in questions from members to the chairman of the committee to get a clearer idea concerning various points in the report. Walter V. Turner, of the Westinghouse Air Brake Co., was present, and answered numerous questions regarding the operation of brakes on long and short trains, making stops with the E T equipment, etc. Members took advantage of the opportunity to ask for information, which, while not bearing directly on the subject of the report, enabled them to learn many things and clear up uncertain points of brake operation with the newer equipment.

"Superheated Steam and the Best Method of Getting Good Results When Engines Are in Service on Trains."

This report was presented by Max Toltz, chairman of the committee, formerly Mechanical Engineer of the Great Northern Railroad, who has made a special study of superheated steam. Last year's report described the Schmidt, Cole, Vaughan-Horsey and Baldwin superheaters. In the present

report a description is given of the Toltz superheater, one of which is in use on the Great Northern. A list of the American roads using superheaters shows that 16 roads have 594, of which 241 were applied in the last year. Of this total the Canadian Pacific has 506—about 80 per cent.—and the Santa Fe 59.

A list of 21 questions relating partly to economy and construction, but mainly to the operation and maintenance of superheaters, were sent to all roads running superheater locomotives. With only a few exceptions full and explicit answers were received. From these it was reported that the economy in coal consumption runs from 10 to 20 per cent., the highest being attained on Great Northern freight engines which show 20 per cent. saving in coal. These figures were taken from the monthly performance sheets. The saving of water averages between 12 and 25 per cent.

The steam pressure on all superheated engines has been reduced from 20 to 45 lbs. below that of the pressure of the sister engine worked with saturated steam. In consequence the cylinders have been enlarged proportionately.

It is admitted by every one that the superheated steam engines not alone handle trains better and in passenger service especially pick up the train quicker, but they can haul a better tonnage than the saturated steam engines of same size and type. The average of this increase in haulage is 10 per cent., while the maximum has been recorded to be 17 per cent.

There has been no trouble with lubrication. On all superheated engines except one, hydrostatic lubricators are used successfully. They feed the oil directly to the valves and to the cylinders. One engine on the New York Central is equipped with an oil pump, which is connected to and actuated by the cross-head and is reported to work satisfactorily.

The amount of valve and cylinder oil used for superheated engines is slightly more than for saturated steam engines, the average being 5 per cent., yet some of the roads claim as high as 20 per cent., but every report states that no exact figures in this respect have been recorded. Only the Santa Fe reports that the superheated locomotives show a saving over corresponding saturated steam engines in the use of valve and cylinder oil, due to reduction in amount of water of condensation in the cylinders.

The large smoke flues fill up with cinders, ashes, etc., and are blown out every second or third round trip, but in some instances where very soft coal is used it was necessary to do this every round trip. The blowing out is done with air from the fire-box end. On one road, due to a certain grade of coal, clinkers were formed on the ends of the superheater elements nearest to the fire-box flue sheet. These clinkers are removed with a special tool or hook from the fire-box end. At any rate it is very important that these large smoke flues and the superheater tubes should be kept clean, so that the degree of superheat will not be decreased. On the Boston & Maine a flue blower is installed in the smoke box in connection with a Schenectady superheater.

On some engines the large smoke flues are screwed into the fire-box sheet and could not be kept tight except by rolling and expanding. In all engines equipped during the last year with smoke flue superheaters, both ends of these flues were rolled and expanded into the flue sheets and have given less trouble due to leakage than the ordinary boiler flues. The Great Northern states that the large flues act at the same time as stays and assist in preventing especially the fire-box flue sheet from bulging out.

In a few cases some of the tubes of the superheater elements have burst or split where they are connected to the U castings near the fire-box. This was partly due to insufficient care having been taken in making the pipes to correct length, and partly it has been traced to using lap or butt welded tubing instead of cold drawn seamless steel tubing.

Particular attention must be paid to the connections of the superheater elements to the steam headers so as to insure

perfectly tight joints, because in case of leakage not alone high pressure, costly steam is wasted, but such steam cuts grooves into the castings and makes it therefore difficult to tighten the joints, which only can be done by plugging the grooves.

Attention must be given to the dampers which are used in connection with the German, Schenectady and C. P. R. smoke-flue superheaters. They should be inspected at least once a week to see that the hinges and also the levers connected therewith have free movement. Particular care should be paid to the packing of the small steam cylinder which is located on the outside of the boiler shell and which actuates the levers and the dampers. Some of the roads have had no difficulty whatever with the dampers by using ordinary roundhouse methods.

In some instances superheater headers were broken, but it was found that it was either due to defective material or defective design. In the Baldwin smoke-box superheater the failure occurs in some of the outside superheater tubes being worn through by the cutting action of the cinders in the front-end.

So far the addition of a superheater has not increased the cost of engine repairs per mile. The few mechanical defects which have been found have been remedied and it is expected that in a short time the defects in the existing types of superheaters will be practically eliminated so that the engine can go from one shopping to another without any special repairs being made to the superheater proper.

The committee's recommendations were as follows:

1. Every traveling engineer should make himself familiar with the design and construction of the superheaters now in use on locomotives.

2. In the operation of the superheaters the following suggestions should be carried out:

(a) When working steam, open throttle valve fully and regulate with cut-off.

(b) Keep water level in boiler as low as in saturated steam engines.

(c) Ascertain that dampers (where equipped) in smoke-box are working properly, also that the small steam cylinder actuating these dampers is not leaking through stuffing-box.

(d) Be sure that oil is carried from lubricator to each end of valve and also to cylinder.

(e) Any leaky steam joints at cylinder or valves should be tightened, and if connections or joints of superheater proper should be found leaking, report at once at end of run.

3. The work of maintaining and taking care of the superheater in the roundhouse is enumerated in the following:

(a) Keep all steam joints and connections of superheater, as well as cylinders and valves, tight.

(b) Piston and valve rings should have a close fit to cylinder walls and valve-bushings, respectively.

(c) Clean or blow out large smoke flues whenever necessary. The more attention paid to this work the more economy will be attained with the engine.

(d) The ends of the large smoke flues which originally were screwed in the fire-box flue sheet and have given trouble by leaking, should be rolled and expanded.

(e) In renewing tubes of superheater elements, use only seamless cold drawn steel tubing. See that they are put in correct length, otherwise, due to contraction and expansion, the connections in the U castings will work loose and leak or tubes will split.

(f) The ends of the superheater elements nearest to the fire-box are supported by lugs or legs of the U castings. Due to the expansion and contraction of the elements, these lugs ride or chafe the bottom of the large smoke flues. Ascertain if this riding or chafing has weakened the large tube. If so, renew the tube.

(g) Pay attention to the dampers, their lever connections and the small steam cylinder. Pack the latter one whenever

necessary, as any leakage will be detrimental to operating the dampers. See that all hinges of dampers, also the lever connections, are in good working order.

(h) The lubricator should be tested whenever necessary.

(i) Injectors must be connected with saturated steam. They will not work properly with superheated steam.

Paragraph (e) No. 3, of the foregoing recommends the use of seamless cold-drawn steel tubing only. On motion, this was amended to read that such tubing has been found to give satisfactory results.

Paragraph (i), referring to injector connections, brought up the question as to whether or not it were possible to get superheated steam to the injectors with present types of locomotive superheaters. The chairman explained that with the throttle valve in the steam dome, as in locomotive practice, this was not possible, but in some kinds of steam motor cars, for example, it is possible, hence the inclusion of the paragraph.

A question was asked regarding the wear of piston rings and the use of the extended piston rod. Mr. Toltz explained that where highly superheated steam is used, these rings wear rapidly, except as noted in the report relative to roads using the extended piston rods, which support the piston at both ends. These results showed that for the higher degrees of superheat the extended piston rods would have to be used. Regarding lubrication (paragraph d, No. 2) he explained that with the wide valve rings referred to in the report the oil was delivered at the center of the ring and the lubrication was entirely satisfactory. It is likewise delivered centrally to the piston.

Much of the time given to this report was taken up in a discussion which was precipitated by paragraph (a) No. 2, relative to a wide-open throttle, and as the members discussed the matter from the saturated steam standpoint entirely, practically all that was said was irrelevant; furthermore, the same discussion occurred last year.

"What Is Good Practice for Traveling Engineers Relative to Coaching and Demonstrating to Firemen Economical Methods of Firing Locomotives and Preventing the Emission of Black Smoke, and the Best Method of Interesting All Concerned in Coal Economy?"

Little or nothing was added to the value of this excellent report in the discussion of the same. The committee had sought information by the usual circular of questions, which were as follows:

1. Does your experience lead you to believe that firemen study carefully and use to advantage books and pamphlets provided them, treating of the principles of combustion and firing, or of best results in giving instruction obtained by actual demonstration made by capable and intelligent firemen?

2. Do you advocate the employment of a traveling fireman or an assistant road foreman of engines, whose duties shall be the instruction of firemen? If so, give your reasons.

3. Please state if you require firemen before starting on a run to see that all openings to ash-pans are unobstructed, in order to permit free access of air beneath the fire.

4. What are your instructions to firemen in regard to putting in coal when engine is starting train? Are your instructions that doors shall be kept closed when the engine is working hard to force the train into speed?

5. When should grates be shaken? Is it your practice to insist on grates being shaken when the engine is drifting or working steam very light, with light draft on fire?

6. Is it the practice on your road to compare the heating value of the coal used on the various divisions before comparing or criticising the performance of engine crews on a certain class of engine in different districts?

7. Do you instruct firemen in the functions of the various front-end appliances and demonstrate their form and arrangement by actual tests?

8. Do you approve of inducing economy in fuel consumption

by offering a premium on fuel saved, and if so, how is it determined, per ton mile or per engine mile?

9. From what source do you obtain firemen, and what early training do you give firemen before placing them on an engine?

10. Do you approve of student trips, and if so, how many? Are your firemen given progressive examinations?

The following conclusions were drawn from the replies: That fuel economy can only be effected through education; but that this education must not be confined to simply teaching the firemen how to fire or the engineer how to work his engine economically, but must extend from the bottom to the top, that is, from the man at the mines to the highest officer of the road, so that all will know and realize the importance of the subject and by their help and co-operation assist us to bring about the desired results.

The efforts of the traveling engineer seldom extend down as far as the men at the mines and not often as high or higher than the office of the superintendent of motive power, but are confined principally to the men in the cab, and while very effective so far as they go, do not by any means accomplish all that could be, were he granted full, absolute and extensive support.

While granting that the traveling engineer is given a certain amount of support from the upper quarters, yet candor compels us to say that this support, except in a few notable instances, is of but an intermittent and perfunctory nature, and therefore as a whole not lasting and of little actual value. This, however, is not through any spirit of laxity or indifference on the part of the higher officials, but is brought about by conditions and the fact that the average official on the American railroads is saddled with so many duties or has such an extensive territory that it becomes a hard matter to give each specific duty the attention that it deserves.

With the mechanical man fuel economy is subordinated to maintenance of equipment and with the transportation man it is ranked by moving traffic, and, consequently, between the two the traveling engineer often fails to accomplish his ends simply for lack of proper support. Fuel economy and the results that can be obtained are of sufficient moment to warrant any railroad in putting on a special man to look after this one feature alone.

The committee then discussed the ten questions of the circular in the light of the answers received to each. The opinions expressed and the suggestions offered in all cases are so good and worthy of thought, that we give them below:

1. Do firemen study? The replies would indicate that firemen as a rule do not study to advantage. The free literature distributed by the various railroad companies on the subject of fuel economy is appreciated, but the men are more inclined to absorb the information through oral instructions and practical demonstrations. This, however, must not be taken as an argument against written or printed instructions. It simply proves the necessity of education along that line. The average fireman does not at first realize that he is simply an apprentice engineer and that when he reaches that position more will be required of him than simply 200 lbs. of steam, and therefore does not care to puzzle his cranium with the problems of combustion, but takes his knowledge in the easiest form and least troublesome doses.

It has been noticed, however, that where firemen have through study mastered the principles of combustion they usually stand at the head of the list of firemen, and likewise after promotion to engineers they have learned the art of mixing brains with CO₂ in the process of combustion, and so can do their work easier and better than their less educated brothers. The habit of applying brains to their work formed when firing remains to their after-advantage as engineers. As the future fireman will use his head as much as his back, we urge that all study be encouraged and to aid him to master what to many is a difficult lesson, that teachers or instructors

or demonstrators (whatever you may call them) be employed to help the willing firemen over the rough places. The unwilling man has no place on an engine.

2. Assistant Road Foremen. This question is closely related to the first question and is the natural sequence of the argument. We most emphatically advocate the employment of competent instructors, but would not call them traveling firemen, but assistant traveling engineers or assistant road foremen. He should have authority over the engineer as well as over the fireman, as without this authority, unless possessed of infinite tact, he might do more harm than good.

The assistant traveling engineer should be recruited from the ranks of engineers and should be a young, active and energetic man, one who can take the scoop when necessary and demonstrate to the fireman the correct way to handle it and get results—namely, the maximum amount of steam from the minimum amount of coal. In addition, however, to being young and active and a first-class fireman, he should also be a first-class engineer, one who can, if necessary, demonstrate to the man on the right side of the engine how he can handle the engine to better advantage and, by so doing, help himself, the fireman and the company. Such a man must needs have brains, but on every railroad there are many of this class, as we all know. This man would naturally fall in line for the position of traveling engineer when the latter is promoted. He should be subordinate to the traveling engineer and should either work directly under or else in harmony with him.

3. Inspection of ash-pans, etc. Most roads require this and all intelligent firemen naturally do it. A few trips with the air openings stopped up soon convinces the fireman of the advantage of keeping them open, and the lesson once learned is not soon forgotten.

4. Instruction to fireman to keep the door closed, etc. This is another lesson that is soon taught by a little experience, but it is always advisable to teach it direct, instead of letting the fireman find it out for himself, as the opening of the door and leaving it wide open while the engine is forced to the limit in lifting the train to speed, is apt to cause other damage: leaky flues, etc. This practice should be discouraged, therefore, as it not only makes extra work for the fireman, but wastes coal and injures the boiler.

5. When should grates be shaken? This depends largely on local conditions, the nature of the coal, etc.; all are agreed, however, on the manner in which the grates should be shaken, namely by short, quick jerks, and not a slow, rocking motion. All are also practically unanimous that as a rule it is much better to shake the grates when the engine is drifting or working light than when being worked hard.

6. Comparison of heating value of coal. This is a refinement in comparison, men and engine efficiency that is practiced by but few roads. We recognize the fact that it is not always practical on all roads and, except for a basis of comparison, is unnecessary. We believe, however, that comparison should not be made between two different divisions, unless all conditions are exactly similar, not forgetting density of traffic.

The comparison should only be made between similar engines in the same class of service on the same divisions, but even that comparison cannot simply be made between passenger and freight, work and yard engines, on a ten-mile basis, with fairness, where regular engines are assigned to and kept, through and local passenger service, fast, slow and local freight, etc., as in that case, to be absolutely fair, comparison should be on a ten-mile-per-hour basis. Time is the one important consideration that is often lost sight of in making any comparison.

7. Instruction of firemen on front end appliances, etc. Too much information on any part of the locomotive cannot be imparted to the fireman or, for that matter, to any one else whose duties throw him in contact with engine service. Where

it may not be practical to move a draft sheet up or down in order to give the fireman ocular demonstrations of its effect on the burning of the fire, yet the information to the effect and also the object of the different front end arrangements should be carefully explained, as the fireman knowing this can at once tell by the action of the draft on the fire if anything has become loosened or misplaced in the front end, in which case repairs can often be made before failure results.

8. Premiums. It is the sense of this Association that monetary premiums do not have the desired effects; in fact, quite the contrary seems to be the case, as it has been found to lead more toward sharp practice on the part of the men than actual economy, and consequently the company is little if any the gainer.

It is our opinion that it is better to encourage a spirit of friendly rivalry among the men and to hold out advancement and promotion as a premium, instead of a small financial remuneration. We further believe that comparison between the efficiency of engines and men should be made on a ton-mile basis between those in absolutely similar service, and a monthly bulletin posted, showing the standing of different men. This bulletin can show the standing in dollars and cents, showing how much more one man cost the company to perform a certain amount of work than another. In addition to this bulletin, however, we favor giving letters of commendation to those at the head of the list, and friendly letters of admonition to those at the foot. If it is finally found that letters of admonition have no effect on the latter, it is well to drop them from the service, as it has been found that any man who cannot be reached through his pride cannot be reached in any other manner, consequently he is unfit for railroad service.

9. Where firemen are obtained. As one of our Past Presidents so aptly expressed it, "You would not hesitate to pick a \$20 gold-piece out of the mud," so it makes little difference where you get your firemen, provided they are the right material. This is governed largely by local conditions and environment. Our experience has been that the best men are recruited from the rural districts. As for early training, the common practice seems to be to let the applicant make student trips on freight engines, usually without pay, with experienced firemen and to continue to make these trips until competent to go alone. This is usually a good tryout, as any man who will follow a modern engine for twenty or thirty days for nothing in order to learn to fire evidently wants the job and will no doubt stick.

10. Student trips. For examination, as mentioned above, student trips appear necessary, and there should be as many as required to win the approval of the traveling engineer or, in his absence, of three competent engineers with whom the applicant has made student trips.

Progressive examinations are heartily endorsed, as they appear to be the only way in which the majority can be induced to study and perfect themselves, but also a very moral way of getting rid of undesirable men when conditions justify. In conclusion, we find the entire matter resolves into a campaign of education, and therefore every one should be encouraged to acquire knowledge.

We must not forget, however, that as a fireman becomes better educated he becomes more observant and consequently we cannot with very good grace keep hammering him to save coal, etc., while at the same time we let him see that for each scoopful he saves on the road a ton is wasted about the round-house and coaling stations. He will be apt to say, "Why don't you practice what you preach?" showing that there are others who need education on fuel economy besides the fireman.

Above all, however, when you find an engine crew or, in fact, any one trying hard to make a showing or a saving, don't forget to encourage them.

An individual paper on "The Electric Locomotive" was read by J. P. Kelley of the New York Air Brake Co. It con-

sisted principally of descriptions of the New York Central direct-current, and New York, New Haven & Hartford alternating-current locomotives, told as simply as possible so that the members of the association unfamiliar with the developments in electric traction along this particular line and the manner in which it is beginning to make itself felt in their special field, might gain some understanding of the construction and operation of these machines. W. C. Myers, of the General Electric Co., was present and explained some of the fundamental differences between steam and electric locomotives. In answer to questions he also told the nature of breakdown or engine failures that were likely to occur to the electric machine, these being much fewer, and less liable to cause delays on the road, than with the steam locomotive.

"How Can the Road Foreman of Engines Interest Engineers and Firemen in Keeping Posted on Progress in Locomotive Development, Including Valve Gear and Steam Distribution?"

The committee sent out a list of questions as follows:

- (1) Have you a valve-motion model? If so, does it create any interest?
- (2) Do you hold class meetings? That is, appoint some certain day to meet with enginemen and firemen at the different terminals in your territory?
- (3) In explaining valve motion and steam distribution, do you use blueprints? Do the engineers and firemen understand them?
- (4) Have you an old locomotive for use in showing the men the workings of the valve motion and do you think it a good plan?
- (5) Are the men in your territory interested in the subject and what means do you take to interest them?

The answers showed that many roads have valve motion models and that they are very helpful to the men, who take great interest in them. Meetings, as indicated in No. 2, are held and likewise are helpful and foster interest. In No. 3, colored charts are, as a usual thing, understood better by the men than blueprints. In regard to No. 4, a few roads have old locomotives that they use in this way, but a valve motion model is considered as good if not better by most. No. 5 was answered in the affirmative and ways of interesting the men given, such as class meetings, reading rooms, etc.

In the discussion, F. P. Roesch (Southern), who was formerly with the Chicago & Alton, told of class meetings that were held on that road in which they had chalk talks on all subjects of interest concerning the locomotive and its operation, the road foreman taking a leading part. Occasionally the master mechanic, the superintendent and the trainmaster would talk to the men. They did not have models but in the chalk talks would go through the locomotive from end to end. If some especially good performance was made by a crew, mention was made of it in the meeting to show the men that the officers were watching their work and appreciated such achievements, which naturally encouraged all to better efforts. The officers also made it plain that they were glad to listen to suggestions from any one, even from the newest, greenest man, and any suggestion of merit was tried, if practicable, and credit given where it belonged.

Mr. Richardson (Frisco) pointed out the value of such meetings in fitting firemen for meeting emergencies on the road when they become enginemen. They can't learn all of this by observation and experience while firing. They haven't sufficient opportunities. These meetings also help to keep the enginemen up to the mark. The one thing best indicating that an engineman is master of his calling is his ability to get his tonnage over the road in the face of adverse conditions. The benefits of the meetings show up under such circumstances.

Mr. Emos (Pere Marq.) pointed out the value of questioning the men in turn at these meetings, instead of simply lecturing to them, in order to impress the points on their minds.

The suggestion that it was helpful in the attainment of better service to post all engine failures on a bulletin board, brought the information from several members that their roads do this on the theory that the men do not like to be

thus advertised and an incentive to use the utmost care is thus given. Other members did not approve of this plan, thinking it much better to advertise the unusually good performances and make that the incentive for a striving for a good record.

On some of the roads attendance at the meetings is compulsory and on others voluntary. The idea on the latter is that the meetings should be made so interesting and instructive to the men that they will be willing and anxious to attend. Some of the road foremen have the men instruct each other by relating their experiences in breakdown and failures and how they managed.

"In What Manner Can the Road Foreman of Engines Best Assist in Increasing the Net Earnings?"

After comparing briefly a railroad company to a large manufacturing concern, this report endeavors to show the importance of the road foreman's part in helping the railroad produce what it has to sell, viz., transportation, by getting out of the power the highest efficiency. The need of co-operation between the road foreman and the transportation department is pointed out. The former can do much toward securing the happy mean between overloading locomotives on the one hand and overcaution on the other. Various points to be watched in locomotive operation are gone into in detail in the report and the saving possible in each case shown or indicated. The road foreman is advised to study human nature and know the men under him.

In the discussion Mr. Conger suggested that the best way for members to show their appreciation of this good report was to go home and follow its teachings. Several members spoke of co-operation between the mechanical and operating departments as the best way to help the earnings. One described conditions on his road some months ago when they were having numerous engine failures, excessive overtime, etc. This situation was remedied and smooth running secured by putting the superintendent, the despatcher and the road foreman of engines under one roof and having them all work together. Another member told of being on a road where these two departments persisted in working at cross purposes and in time the road went into the hands of a receiver. Mr. Talty (D. L. & W.) said that insistence by the road foremen on regularly assigned engines was the most important thing he could do toward helping the earnings. Mr. Roesch said the real answer to the question forming the subject of the report is "education," and the most important single item to which this education can be devoted is "fuel." Mr. Conger said the most important single element in railroading which the men can be educated to save is "time." Teach them how they can save time in all of the different operations of railroading. Mr. Richardson (Frisco) said road foremen could save much time if they were clothed with authority to have their instructions obeyed by engine crews rather than having to leave the enforcement of these instructions and the disciplining of the men to higher officers. If the road foremen are not competent to do this they are not fit men for their positions.

"The Influence of a Thorough Education on the Work of an Engineer and Fireman as a Factor in His Success."

This was an excellent individual paper by C. B. Conger on the value of education. The matter was clearly and convincingly set forth, the style being simple and lucid. It made plain the advantages of the educated man and the disadvantages of the uneducated. Education and training in the engineman give him confidence, which is another word for courage in the face of emergencies. Safety is the first desideratum in railroad operations, economy the second. Correct knowledge is highly essential to the proper acquirement of either.

There was no discussion, but the author was tendered a rising vote of thanks.

"Steam Reversing Gears."

This was an individual paper by F. P. Roesch. It described and illustrated several such gears used respectively on the Central Railroad of New Jersey, Southern Pacific, Philadelphia & Reading and the Mallet compounds of the Great Northern. The first three were used 20 to 30 years ago and are no longer in use. The last-named, the McCarroll gear, was first used in 1904. The chief trouble with the present design is that it is too light for the work and is therefore subject to occasional failures. The difficulty of hooking up the reverse lever on modern large locomotives at high speed has produced strong advocates of power reversing gear. The author of the paper suggests the combination of a lever and screw reverse gear.

In the discussion of this paper some questions were asked about the ease of reversing an engine having Walschaert gear as compared with one having Stephenson gear. The testimony of those having had experience with both was in favor of the Walschaert.

W. G. Wallace spoke of having recently inspected the power reversing gear on the Great Northern Mallet compounds. He said that while its operation seemed to be slow compared to a lever, the men were pleased with the gear since it was sure and put the lever where it was wanted; in other words, what it lacked in speed it made up in positiveness of operation. He said it took about 11 secs. for the lever to travel from one "corner" to the other.

Mr. Meadows (M. C.) didn't think power reversing gear necessary on even the largest modern locomotives of the usual types if the valves are properly lubricated. It would provide another possible source of engine failures and prevent the reverse lever acting as an indicator of dry valves. He spoke of 23 in. x 32 in. engines that are handled satisfactorily with the reverse lever, care being taken to keep the valves well oiled.

"Increasing the Size of the Air Pump Exhaust to Reduce Noise and the Draft on the Fire."

This was an individual paper by J. A. Talty. Inquiries of member roads showed that most of them favor putting the air pump exhaust into the cylinder exhaust passages, which reduces the noise and draft and saves coal. The experiment was tried of increasing the pump exhaust pipe on a locomotive from 1 1/4 in. to 1 1/2 in., which lessened the noise and draft appreciably. A further enlargement to 2 in. had a correspondingly greater effect. Another experiment was tried of putting a 10 in. x 12 in. reservoir in the 2 in. exhaust pipe about 2 ft. from the pump, which produced a further decrease in noise and draft. The exhaust was so mild that it barely prevented gases and smoke from issuing from the firebox door, and a measurable saving in coal was effected.

Mr. McManamy said the Pere Marquette has 450 locomotives on which the air pump exhaust is led to the tank, it being arranged so that the exhaust can be turned into the tank or into the cylinder exhaust passage by a valve in the cab. They put water into their boilers at from 225 to 250 deg., the engines steam much better and there is a material saving in fuel.

"Steam Heat Operation in Train Service."

This individual paper of J. P. Griffin (C. & A.) described the different systems of steam heat in use on railroads and the difficulties and advantages experienced with each. While the road foremen of engines have not, as a rule, much to do with the steam heating, many failures are due to the trainmen not being properly educated in the proper way to handle and care for the equipment. The writer of the paper thought it would be well for the road foremen to use whatever effort was consistent to have such instructions given as would insure avoidance of the many annoying mistakes that occur. He referred to rules and instructions issued by different roads on this subject, mentioning particularly those of the Chicago, Milwaukee & St. Paul as being the best he had seen.

In answer to a question as to what was the allowable

pressure in the train line on different roads, Mr. Conger said that 60 lbs. is about all the ordinary couplings in service will carry without excessive leakage. As long as yard men and trainmen continue to allow the steam line couplings to be pulled apart when cars are uncoupled, so long will trouble and excessive leakage, with the consequent drain on the locomotive boiler, continue. It would be to the advantage of every road using steam heat to have a special man to give his entire time to the same. He would save his wages many times over in the lessened abuse of equipment, not to mention the good results of properly heated trains and satisfied passengers. He should have full authority and responsibility to enforce his requirements.

Mr. Hurley (N. Y. C.), Past-President of 1907, in accordance with the custom of the association to send its most recent past-president to the convention of the Master Mechanics' Association as a delegate and have a report from him at the next convention, read a brief report. He mentioned the Master Mechanics' committee report on boiler washing and the topical discussion on the smoke nuisance as the two subjects of most interest to the Traveling Engineers' Association.

The subjects for next year's convention are as follows:

Individual Papers.—"The Construction of the Electric Locomotive, with Explanation of Apparatus and Stereopticon Views Illustrating as Far as Possible Parts Requiring Greatest Attention by the Engineman, and the Proper Handling of the Same." "Proper Method of Handling Air Brakes on Long Trains to Insure Smooth Service." "Modern Methods of Cleaning Ash Pans." "Piping Arrangements for Steam, Air and Water Between Locomotive and Tender; Rubber Hose vs. Metallic Connections."

Committee Reports.—"Most Economical Methods of Maintaining Tool Equipment and Supplies Other Than Coal, Water and Sand on Locomotives in Service." "Boiler Check Valves and Feed Water Delivery Pipes. Does Their Location and Arrangement Affect the Working of the Injector, Steaming of the Boiler and the Formation of Scale?" "Functions of the Parts of Walschaert Valve Gear and Method of Procedure in Failure or Breakdown on Simple and Compound Locomotives, Including the Mallet." "What Can Be Done to Obviate Tender Derailments?"

PICKED UP ON THE ROAD.

BY GULF.

Talking about guessing sheets, I traveled on one road the other day that had apparently given up all hope of running as per its sheet, at least on some of its trains, for it announces that "northward through trains will be held at X and southward through trains at Y indefinitely for connection when necessary," with the exception that one certain train "will be held at X one hour for connection when necessary, unless there is sufficient travel to justify two sections, in which case the first section will leave on schedule time." A pretty commentary on the connecting lines, and a pretty state of affairs it indicates! What a record the dispatcher's sheets of those connecting lines must have shown before a management would bring itself to print such a notice as that! There is a rumor, for which I cannot vouch, that the New York Public Service Commission intends to compel the roads of the state to make schedules that they can run to if those now in force cannot be maintained.

A good many years ago the New Haven road put parcel racks in their cars that were worthy of the name. They were broad and generous and extended the whole length of the car, and would carry anything that a passenger could stagger under. They were appreciated and talked about, and written about, and other roads were urged to go and do likewise, and still the A. B.

C. line and others clung to the parcel arrangements that wouldn't hold a lady's reticule, to say nothing of her hat. Once, as I recorded before, I counted fifty-odd dress suit cases and satchels under the feet of passengers on the floor of a single car. At that time the General Passenger Agent of the A. B. C. informed me that the road contemplated the use of a larger rack. And so it went on for years. The only inference to be drawn was that either the railroad men didn't read the papers or didn't travel in day coaches, or didn't care, or all three. But now, after about thirty years, other roads are beginning to use the rack, and it looks as though before another thirty years had passed it might become general practice. And now I am wondering whether this change of heart and practice is due to railroad initiative or to the selling abilities of some supply agent, who found that he could get more for a real rack than for a reticule attachment. But whatever the cause the public is to be congratulated on the change, and from what I hear on the cars there is due appreciation of the improvement.

I sometimes take it upon myself to criticise railroad operation, because being a layman and out of the fight I can tell exactly what the man in the dilemma ought to do, just as an old maid has the theory of the training of children down to a nicety. But there is one thing I have never found necessary to criticise adversely, and that is the treatment that a man receives from managing officials or departmental heads when he goes there with a legitimate errand. The courtesy that he will receive, even though he goes merely as a seeker for information, is enough to gladden the heart. It always seems to me that these men consider it their chief end and aim in life to throw wide open the doors of available statistics and information and bid one enter and browse at leisure. It is doubtful whether there is another set of men in the world who would take the pains to show what they have and explain why they have that particular thing and how it works as well American railroad officers.

I thought until the other day that the desire to live with the rich and after the manner of the rich, the imitation of Captain Jinks who bought pork and beans for his horse, though it was quite beyond his means, was a characteristic of the individual man, and not of the corporate. I always supposed that the corporation, especially the railroad corporation, was out for the lucre, and whether its locomotives wore jackets of planished Russia or plain painted sheet, was of no account, so long as they hauled the trains and dividends could be duly declared. But how little one really knows! My undeeceiving on these lines opened my eyes to the fact, though I suppose I might have noticed it, that if the locomotives of the A. B. C. are fitted with an adjustable petticoat or an apron with a curled edge, the X. Y. & Z. must straightway come out with a frilled petticoat and a broader apron. Or, to put it just as my friend at the head of his department did: "We are a poor road, but we have a good legitimate business hauling oats. There is plenty of good money in oats, but we can't compete in through passenger traffic, and all the advertising in the world won't turn it our way. So it doesn't pay, and I don't think it ever will pay to run expensive through trains and advertise electric lights and diners and all manner of frills. People rarely travel for sentiment; they go to get there, and we can't make them spend more time to do it because we yell, for they know that the A. B. C. makes just as good and better time. But the management says that so long as we can get our cars hauled through from New Orleans to Rio Janeiro, even though our own rails stops at Pernambuco, we must make as good a showing as that disagreeable A. B. C. with all her airs and riches." Possibly this may be good business, and possibly the general passenger agent can prove that it is, but somehow it looks to me very much like the poor man trying to ape his rich neighbor.

THE THEORY OF RAILROAD RATES.

BY WILLIAM Z. RIPLEY,
Professor of Economics, Harvard University.

II.

Up to this point it has appeared as if in making distinction between the constant and variable expenditures of a railroad, it was the latter only which grew as the volume of traffic increased. This is not absolutely, but only relatively true, not only of the so-called constant operating expenses, but of fixed charges as well.* Everything depends upon the length of time under consideration. Many expenses follow the fluctuations of business, not evenly but by jerks. Up to the full limit of utilization of the existing plant, each increment of traffic seems to necessitate but a very small increase in the so-called variable expenses, with hardly any change at all in the constant ones. A branch road can haul more and more tons of freight with a given outfit of cars and locomotives by merely increasing slightly its outlay for fuel, train service, wages and supplies. But after a certain point more rolling stock must be provided to accommodate the growing business. As each of these additions to property occur, they contribute new quotas to the fixed charges, and to the so-called constant expenses of operation, such as maintenance of roadway and the like. Nor can these new expenses be allocated to the new business alone. The moment the old traffic has outgrown the existing plant the new expenditure becomes chargeable to all the business alike. The new outgo must be distributed evenly over the entire volume of traffic thereafter handled. Each ton, both of old and of new traffic beyond the haulage capacity of the locomotives then in service, is equally responsible for the expense of new equipment purchased. Although the old business could have been handled without a million dollars spent for double-tracking or terminal enlargement, this addition to the expense of maintenance of way or to the fixed charges is equally attributable to every ton of traffic hauled. The new through-freight trunk line built by the Pennsylvania Railroad since 1900, paralleling its old four-track one, represents both in the cost of maintenance and capital charges, a sudden jump in the expense of transporting each ton of freight on both lines until such time as the new business grows to a point where it can support the new line by itself alone. The general condition of congestion reached in 1903-5 on the eastern trunk lines and in the West and South in 1906-7, manifested mainly in the need for more tracks and terminals, represented the permanent outgrowth of the old plant; and necessitated a readjustment of capital expenses for the purpose of enlargement. Viewed in a large way over a term of years, nearly every expenditure, even the fixed charges which appear constant or independent of the volume of business, thus become in reality imbued with more or less variability.

The preceding considerations hold good not alone of increased facilities, but of their curtailment as well. This point is often neglected in respect of capital outlay, which once made cannot be recalled. Rotting of ties we have held to be a constant expense of operation. It goes on steadily, whether traffic conditions be good or bad. But on the other hand those ties, if they be under a third or fourth track, would never have been laid had not there been a promise of business sufficient to render the added investment profitable. As Lorenz observes "the question is not, What expenditures would disappear if a certain proportion of the traffic should be discontinued? but What expenditure would not now be incurred if that traffic had never been called forth?" Viewed in this way even the necessary replacement of ties under a (temporarily) little used extra track, is an expense determined at some time, even if not always by the volume of the business. In the long run, therefore, the percentage of total cost which

we may assign to an increase in the volume of traffic, is higher than appears from a cross-section of expenses, taken, as was at first had in a given year. Lorenz has illustrated this steady expansion of all groups of expenditure in relation to expansion of traffic by the following table, in which the actual figures for each year [brought down to date] are replaced by an index number based upon 100 for the year 1895:

		Gross earnings from operation	Ton miles	Passenger miles	Total operating expenses	Maint. of way and structures	Maint. of equipment	Conducting transportation	[Gen'l] expenses
1895	100	100	100	100	100	100	100	100	100
1896	107	111.8	107	106	111.2	117.9	103.1	99.4	98.4
1897	104	111.6	100.5	103	108.5	106.4	99.8	98.4	98.4
1898	116	123.8	109.7	113	120.4	124.9	109.1	101.1	101.1
1899	122	145.1	119.7	118	126.8	134.6	115.6	110.0	110.0
1900	138	166.1	131.5	132	150.4	164.2	126.9	112.7	112.7
1901	147	172.5	142.3	142	164.6	173.2	135.5	121.8	121.8
1902	160	184.5	161.5	154	185.2	200.2	151.7	131.4	131.4
1903	176	203.2	171.6	173	198.6	225.6	174.7	142.1	142.1
1904	184	204	179.8	184	194.8	250.7	188.6	153.5	153.5
1905	193	219	195	191	191	253	179	154	154
1906	216	254	206.5	212	216	288.8	194	166	166

According to this showing, maintenance of equipment, which we held in our analysis to be about one-half a constant expense and independent of traffic, especially after 1900, appears to have actually outrun the expansion of ton-mileage and passenger business. How largely this is due to actual purchases for the sake of future growth is not determinable. And maintenance of way outlay—one of our largely constant expenses—has increased, in fact, more rapidly than conducting transportation, which we held to be mainly variable. But these figures are confused by the failure to differentiate in the accounts, mere maintenance from actual improvements and additions to plant. Expenditures for these latter purposes, charged to operating expenses rather than to capital account, have been so enormous during these years of prosperity that they confuse the true facts utterly. It is to be hoped that now with the revised statistics since 1906, which will permit a clearer definition of these expenditures in detail, an analysis covering a series of years will bring out the real relationships. Equally important is the fact that these years have been characterized by rapid and extensive rises, both of prices and wages. Had our table covered a longer series of years the results would have been more clear. Until such an analysis be made it will suffice for our purpose, viz., the analysis of the principles of railroad rate-making, that we adhere to our first general conclusion, namely—that in the total expenditures of a railroad *at any given time* about two-thirds of them are constant, while one-third only vary with the ups and downs of the volume of traffic. Comprehending in survey a long period of years it might happen, as Acworth concludes, that nearly one-half of the total expenditures were entirely fixed in character, leaving the other half as dependent upon the amount of transportation effected.

Railroad expenditures, as Taussig clearly pointed out a number of years ago, afford a prime illustration of the production of several commodities by a single great plant simultaneously at joint and indistinguishable cost. The classic economists illustrated this law by the joint production of wool and mutton and of gas and coke. In both of these instances neither commodity could conceivably be produced alone. Nor was either one, so to speak, a by-product of the other. So nearly of equal importance are the two, in fact, that the cost of production for each may approximately be determined by dividing the total cost according to the relative worths of the two or more products. The law of joint cost with reference to the production of transportation is somewhat different. Compare, for instance, the carriage by a railroad of thousands of passengers and different commodities in every direction, under varying conditions, singly or by wholesale, slowly or by express, over a given set of rails every day; with the

*Lorenz in Quarterly Journal of Economics, XXI, pp. 283-292.

operation of a great refinery producing simultaneously kerosene, gasoline, lubricating oils and greases as well as various odd chemicals. Both are examples of production at joint cost, but with various important contrasts. In the refinery all the costs are joint. All the processes are interlocked. Every increase in the output of kerosene produces *pari passu* an increase of the other commodities. On the railroad, not all but only a part of the costs are joint, in such manner as has been shown. From the joint portion of its plant—roadway rails and locomotives, the railroad may produce transportation of different sorts quite independently. It may choose to especially cultivate its passenger traffic, or its cotton or coal business. After a certain point of congestion is reached, the various sorts of traffic on the railroad may even become actually competitive with one another so far as the joint use of the plant is concerned. It is plain that this could never happen in the refinery. The use of more stills for making kerosene would automatically produce more by-products of every sort. But on a railroad it might well happen that the coal and passenger business might come to interfere with one another. A choice of emphasis as between fast refrigerator beef or fruit traffic, and limited express service, may have to be made on a long single track line. Nevertheless, in spite of these peculiarities of transportation, the general law of joint costs holds good, in that it is a demand for each service rather than its cost which finally determines the chargeable rate. This must be so because of the fact that the cost of each shipment is so largely joint and indeterminate, and that a large part of the entire plant is indistinguishably devoted to the general production of transportation without reference to particular units of business. One concrete example may serve to illustrate this point.

For years attempts have been unsuccessfully made by accountants to effect the primary separation between expenses of passenger and freight business, in order to determine the cost of transportation per unit in each case. Some companies like the Louisville & Nashville and the Burlington system, still divide up the two, usually on the basis of the engine mileage for each class of traffic. This may be serviceable enough for comparisons of costs from year to year in the same company, but it has no general value and it may moreover become highly misleading. The most absurd conclusions may result. Thus at one time it appeared from such data compiled by the Interstate Commerce Commission that the New York Central, with five times the density of traffic of the Illinois Central, was actually conducting its freight business at a much higher cost per ton mile. Such inconsistencies induced the Interstate Commerce Commission in 1894 to abandon the attempt at any such primary separation of accounts. It has since been reattempted, in special cases, as by the Wisconsin Railroad Commission in its notable "Two-Cent Fare" decision in 1907, the division being made according to a number of different criteria.*

But it is plain that a very large proportion—probably over half—of the expenditures for freight and passenger business are entirely joint, however distinct the revenues from each service may be. We have seen that approximately two-thirds of the outgo is incurred on behalf of the property as a whole. Certain expenses, to be sure, such as train wages, coal consumption and the maintenance of rolling stock, are readily divisible; but with respect to the maintenance of way and structures—about 40 per cent. of the total outgo—all guides fail. Even in respect to the cost of rails due to wear and tear of train movement, we are quite at sea in the allocation of expenses. Freight trains may indeed be four times as heavy as passenger trains, but on the other hand they move at far higher speeds. And then finally how about the large item of capital cost, the proportion of outgo for fixed charges?

This equals about 27 per cent. of the total expenditures for the United States as a whole. We may, of course, divide these expenses arbitrarily on the basis of the relative gross revenue from freight and passenger business respectively. And yet how absurd it would be to attempt to allocate an expense of a million dollars for the abolition of grade crossings in this way. As between the New Haven road, with passenger and freight revenues about equal, and a Western road with only one-tenth of its income derived from passengers, the apparent cost of freight business on the Eastern road would be absurdly reduced by any such process. The facts are plain. So many expenditures are incurred indiscriminately on behalf of the service as a whole—being an indispensable condition for operation of the property at all—that no logical distinction of expense even as between passenger and freight traffic is possible. This being so, how futile it is to expect to be able to set off the expenses due to any particular portion either of freight or passenger service, and especially to any individual shipment. It may oftentimes be possible to determine the *extra* cost due to individual shipments. This, of course, mainly applies to what are called movement expenses. Thus the haulage cost of a 2,000-ton grain train from Chicago to New York has been estimated at \$520. But how small a part it is of the total cost, the preceding analysis must have made clear. In the recent Texas Cattle Raisers' Case, detailed analysis of the extra cost for the traffic in cattle was presented.* The starting point in this attempt was necessarily an allocation of freight and passenger expenditures, which if defective would vitiate the entire subsequent calculation as to costs. In this instance, it was the judgment of the Interstate Commerce Commission in its final decision in 1908, that no such separation of expenditures was possible as a basis for the determination of cost of service.

A railroad theoretically presents a clear example of an industry subject to the law of increasing returns—that is to say, an industry in which the cost of operation grows less rapidly than the volume of business done. Each ton of freight added to the existing traffic costs relatively less to haul. From this it follows, obviously that the net returns increase more than proportionately with the expansion of traffic. This may be demonstrated by a simple calculation. It has already been shown that only about two-thirds of the total expenditures of a railroad are applied to operation, the remaining third being devoted to capital account. Moreover, of these two-thirds of the total applied to operating outlay, only about one-half responds to any change in the tonnage, the other half being constant up to a certain point. Otherwise expressed, an increase of 1 per cent. in traffic and therefore of revenue, produces an increase in expense of only one-half of two-thirds of 1 per cent. Two-thirds of the entire increment of revenue goes to profit. Carry this increase further and the effect is more striking. Suppose traffic to grow ten-fold. The former outlay being \$100 for a given volume of business, would be divided according to our rule as follows, one-third for fixed charges, one-third for constant operating outlay and one-third for variable expenses. With ten times as much traffic, only the last group of outgoes will expand. One thousand dollars revenue would therefore become available, under the new conditions, to pay the same fixed charges as well as constant operating costs. The total outgo would thus become \$33 plus \$33 plus \$330, or \$396 in all. Almost two-thirds of the increment of revenue still remains as profit. It might well happen that such an expansion could not ensue without large increases in the capital and plant, as has already been noted, but up to that point this calculation would hold good. Webb, in his *Economics of Railway Construction*,† has illustrated this by the following statement varying but slightly from our foregoing assumptions. Let the distribution

*Wisconsin Railroad Commission Report, 1907, p. 101. Compare also Woodlock, p. 91; U. S. Statistics of Railways, 1894, p. 70; Yale Review, 1908, p. 382; and Record Cincinnati Freight Bureau Case, II, p. 941.

*Interstate Commerce Commission, No. 732, p. 423. Compare also in re advance in freight rates, 1908, p. 423, and Yale Review, 1908, p. 287.
† Page 36.

of expenditures for given conditions, producing \$100 of revenue, be these, viz.:

Operating expenses	\$67
Fixed charges	28
	<hr/>
Profits for dividends	\$95
	5
	<hr/>
	\$100

Now assume an increase of 10 per cent. in the traffic and consequently in the revenue; but assume also that the average extra cost per unit, of the new business, is only 40 per cent. as much as for the pre-existing tonnage. Were the added cost of each ton mile as great as before, the operating expenses would rise by the full 10 per cent. of \$67. But on Webb's assumption, they will rise by only 40 per cent. of 10 per cent. The new account would then stand thus:

Operating expenses (\$67 plus 40 per cent. of 10 per cent. of \$67)	\$69.68
Fixed charges as before	28
	<hr/>
Income, increased by 10 per cent.	\$97.68
	110.00
	<hr/>
Balance for profit or dividends	12.32

By an increase of 10 per cent. in tonnage, balance for dividends has more than doubled.

In this connection it will be noted that a constant rate of return per unit of business newly acquired has been assumed. Attempts have been made on behalf of the railroads, during the long period of decline of ton-mile revenue down to 1900, to show that this is an unreasonable assumption; in that increased traffic is presumably to be had only by a progressive lowering of the rates charged. This contention has been effectively demolished by the steady and remarkable growth of traffic since 1900, even in the face of a substantial rise of rates all along the line. A necessary corollary to our proposition, beside that of the maintenance of a constant scale of charges, is, of course, also of the continuance of a given grade of service. If more luxuriously appointed passenger trains or quicker freight service have to be given in order to produce the growth of business, the added costs of operation must, of course, be taken into consideration. But with a given grade of service and constant rates, there can be no question, up to the point of full utilization of the existing plant, that the operation of railroads affords clear demonstration of the law of increasing returns.

The obverse side of the law of increasing returns is also of great importance. For the same reason that when traffic increases only a portion of the expenses are affected, it follows that when business declines only a part of the costs can be lopped off. In other words, a reduction in the volume of traffic does not in itself alone lead to a corresponding reduction in the operating expenses. Of course, many of these latter may, as we have seen, be temporarily postponed, as they were in 1893-97, especially in the group of maintenance-of-way expenses. In such an event they must ultimately be made good by extraordinary outlay at some later time. But unless they be thus postponed, and unless the rates charged for service be reduced in order to stimulate traffic, it is inevitable that the margin of profit will drop as rapidly, as it tends to rise with increased volume of business. This may be illustrated by the following computation, taken also from Webb's Economics of Railway Construction. Assume the total revenue from a given business to be \$100, and assume it to be distributed as before, viz.:

Operating expenses	\$67
Fixed charges	28
	<hr/>
Leaving profit	\$95
	5
	<hr/>
Total	\$100

A decline of 10 per cent. in the volume of tonnage, if the portion lost, cost for operation per unit, as much as all the rest, would obviously reduce the operating expenses by 10 per cent. also. Let it next be assumed, as was done previously, that the average extra cost per unit of the latest increment of business was only 40 per cent. as much as for the remainder of the

tonnage. How closely this will approximate the facts in any particular instance will depend upon the density of traffic attained in relation to the capacity of the existing plant. If the addition of the last 10 per cent. of business did not increase the large proportion of fixed expenses at all, and only added 40 per cent. per unit more to the variable expenses; *per contra*, the loss of it would merely reduce the variable expenses and still leave the constant outlay the same. On this assumption, by the loss of 10 per cent. of business, the total amount of operating expenses under the new conditions would be lessened, not by 10 per cent. of \$67, but by only 40 per cent. of 10 per cent. of \$67. The income would, however, decline by the full amount of 10 per cent. The account, after a loss of 10 per cent. of business, would then stand somewhat as follows:

Operating expenses, (\$67—40 per cent. of 10 per cent. of \$67)	\$64.32
Fixed charges, as before	28
	<hr/>
Income, reduced by 10 per cent.	\$92.32
	90.00
	<hr/>
Leaving a deficit of	\$2.32

Or, in other words, a decline of 10 per cent. in tonnage has transmuted a 5 per cent. dividend condition into one involving an actual deficit nearly half as great as the former profit.

The sudden reversal from apparent prosperity to very real distress, such as occurred during the fall of 1907, is thus explained. Its suddenness may be shown by the following table of monthly gross and net earnings, promulgated by the Interstate Commerce Commission.* The acute panic occurred during October, but its effect was not apparent until the following month. The total mileage included is shown by the first column:

	Mileage.	Earnings per mile	
		Gross.	Net.
1907. July	223,900	\$1,022	\$304
1907. August	224,100	1,079	345
1907. September	224,300	1,045	314
1907. October	224,700	1,116	337
1907. November	224,800	981	261
1907. December	224,400	861	197
1908. January	198,700	746	148

This table shows that whereas under full prosperity, up to and including the month of October, the net revenue was about 30 per cent. of gross; after the sharp decline in traffic, it dropped in November to 26 per cent., and progressively thereafter to 20 per cent. in January. In other words, a decline of about one-fourth in the gross revenue, within four months, entailed a loss of over 50 per cent. in net earnings. Higher operating expenses in the winter may have exaggerated this tendency, but, on the other hand, drastic economies were put into effect, which would more than offset the difference.

The urgent need of at once meeting any loss of business by prompt reduction of operating expenses is apparent. But there is comfort to be found at this point in the fact that each 1 per cent. saved in operation at any given time results in saving 2 per cent. for the net earnings. According to our estimates and as a rule practically, operating expenses equal about two-thirds of gross revenue, leaving one-third to meet charges and pay dividends. Every reduction from this two-thirds of gross revenue, therefore, transferred to the balance, increases the latter proportionately twice as much. This fact in turn explains the urgent pressure always brought to bear at such times to effect economies all along the line. These are too often indiscriminately made, as Eaton in his Railroad Operations has pointed out. Such paring down of expenses should always be made with an eye to their ultimate effect upon the operating efficiency of the property in the long run. To postpone much-needed repairs of equipment during a period of depression, like that of 1907-08, when repair shop costs are at a low ebb, only to hamper operation and to effect repairs under pressure when business revives, is an instance of such wasteful economy.

(To be continued.)

SLOPING FIREBOXES ON LOCOMOTIVES.

BY C. H. CARUTHERS.

The sloping firebox, or to speak more accurately, the firebox with a sloping roof-sheet, appeared very early in the history of the locomotive. Drawings usually shown of Stephenson's "Rocket," which at Rainhill, England, in 1829, revolutionized locomotive design and construction and became the prototype of our magnificent machines of the present day, together with the model of the same engine built by the London & North-Western Railway Co., for exhibition at the Columbian Exposition at Chicago, in 1893, show this engine with a roof-sheet having a pitch of about 54 deg.

The advent of the Bury dome soon after the building of the "Rocket," and its subsequent very general use in Europe and America until 1852, precluded the building of many boilers with sloping roof-sheets during that period, although Ross Winans began to use it on his "camels" soon after building his first engine of that type in 1848, and applied it to all of his engines built thereafter with but few, if any, exceptions until the closing of his plant in 1860.

In 1852 Milholland brought out his "Pawnee" type with a sloping roof-sheet and the Philadelphia & Reading used it thereafter on all engines of its equipment in both freight and passenger service until shortly after the construction of the Wootten boiler in 1877, the first of that design also using a sloping roof-sheet.

Richard Norris & Son built a 4-4-0 passenger engine in 1853 with a "Phleger" boiler, and followed it with several larger engines for freight service with the same design of boiler, between that date and 1859. Of course, all of these had sloping roof-sheets. Although the Bury dome has been just alluded to as preventing the construction of boilers with such roof-sheets, that statement should be understood to refer to its use in direct connection with the horseshoe type of firebox. In this Norris passenger engine a Bury dome was used, but it was placed on the barrel of the boiler directly in front of the rear tube sheet. Winans' camels also used a dome which was simply the Bury removed to the extreme front end of the boiler.

The year 1853 also witnessed the building of the first "Hayes," or ten-wheel, camel; a type thereafter built in considerable numbers for the Baltimore & Ohio until 1874, many of which remained in service on that road until 1894 or even longer. All these engines had sloping roof-sheets.

In 1857 the Pennsylvania rebuilt its engine "Blue Ridge" at the Altoona Shops and substituted a sloping roof-sheet for the original straight one of the Baldwin make. The firebox of this engine and that of the Phleger type of boiler, have already been illustrated in the *Railroad Gazette* of Dec. 13, 1907.

In 1860, M. W. Baldwin & Co. built an engine for the Mine Hill Railroad, from designs of Mr. Wilder, the superintendent of that company, on which the dome was placed about the center of the boiler, and both front and roof-sheets fell away from it at a considerable angle.

In 1875 the Pennsylvania brought out its first class I (new classification, H1), which followed almost the identical lines of the Winans Camel in the construction of the firebox. From that time, these engines were built in large numbers both at the shops of the company and elsewhere, the type having been adopted as the standard of the company for freight service, until about the middle of 1885, when the still larger class R (now H-3) with Belpaire firebox, became the standard. Many of the class I engines are still used in shifting service and on construction trains.

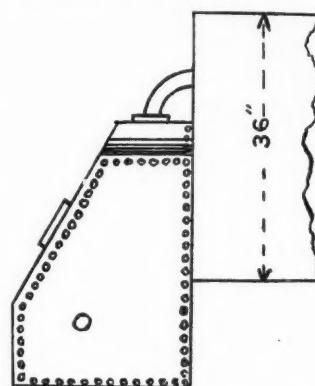
In 1881 the same company designed and built a somewhat similar boiler for use on a double-ended passenger engine, but placed the dome on the forward ring of the barrel and directly behind the smoke-box. The next year it was followed by another with a sloping roof-sheet, designed for the class M (now B-3) shifting engines. Many of these were afterward

built until the Belpaire firebox was adopted for shifting engines in 1892, and are still being used.

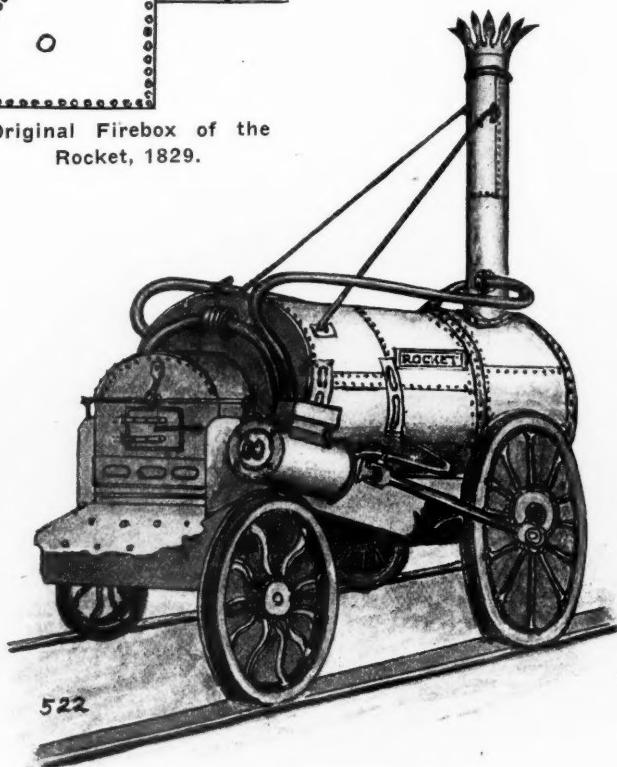
No further attempts to build new boilers with other than the comparatively slight slope found in the roof-sheets of nearly all types of the company's standard equipment, were made until 1903, at which time another "Altoona" firebox, as the various types already described are called in the nomenclature of the company's shops, was designed, and is described in the specification sheet as belonging to classes H3d, H3e and H3f. This design is intended to be applied to any H3, H3a, H3b or H3c engine to replace the Belpaire firebox with

which it was originally built. In fact, it is simply a Belpaire with a sloping roof-sheet. Many of the class of engines named have been thus rebuilt and are now doing efficient yard service.

Reference to drawings and photographs of engines of the



Original Firebox of the Rocket, 1829.



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The Rocket in 1876.

Showing engine as it now stands in South Kensington Museum, London, England. Reproduced from Shaw's Official Tourists' Guide, London & North-Western, 1876.

general type of construction just referred to, will show that the Rocket, the Winans and the Hayes camels, the Norris Phlegers, the Pennsylvania "Blue Ridge," and that company's old Winans camel Seneca, No. 131, which was partially remodeled at Altoona in 1862, and all of the new types of the standard equipment except that last described, have roof-sheets level laterally, and terminating about nine inches below the top of the barrels of the boilers, to which they are attached by a short vertical end-sheet. These roof-sheets are but slightly rounded at their sides, and in an old Winans camel of the Baltimore & Ohio, No. 118, which I saw in 1893 at Benwood, W. Va., where about one-half of the original roof-sheet remained. It extended from the back of the firebox almost to the opening for the second firing chute and formed a right angle at its union with the side and back sheets. If I remember rightly, the sheets were united by angle irons.

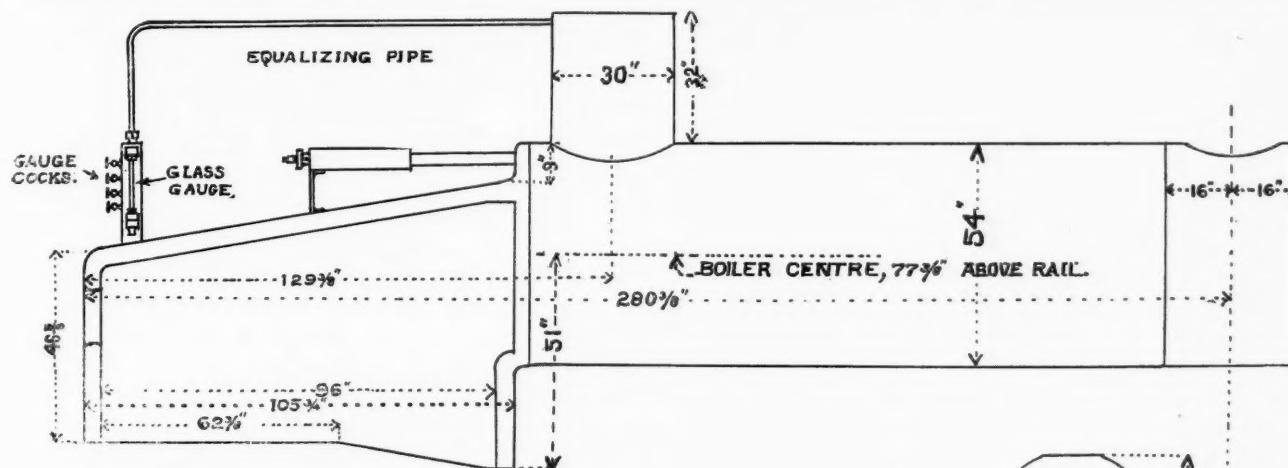
In the Pawnee and other types, Milholland formed his sloping roof-sheets in semi-circles described with about the same radii as those of the cylindrical part of the boilers to which their front ends were attached flush at the tops instead of by short end-sheets as in the other engines. The Baltimore & Ohio company also followed similar lines in rebuilding the most of its camels of either type, with the exception of the 118 and a few others in which the new portion of the roof-sheet began flat, and gradually rounded until it coincided with the waist sheet at the point of union.

The reason for making this change in these sloping fireboxes is not quite clear. A slight additional water space was gained, but the value of roof and crown sheets placed in almost the same plane was lost, and the weight on the rear wheels was increased, even in engines where it had evidently

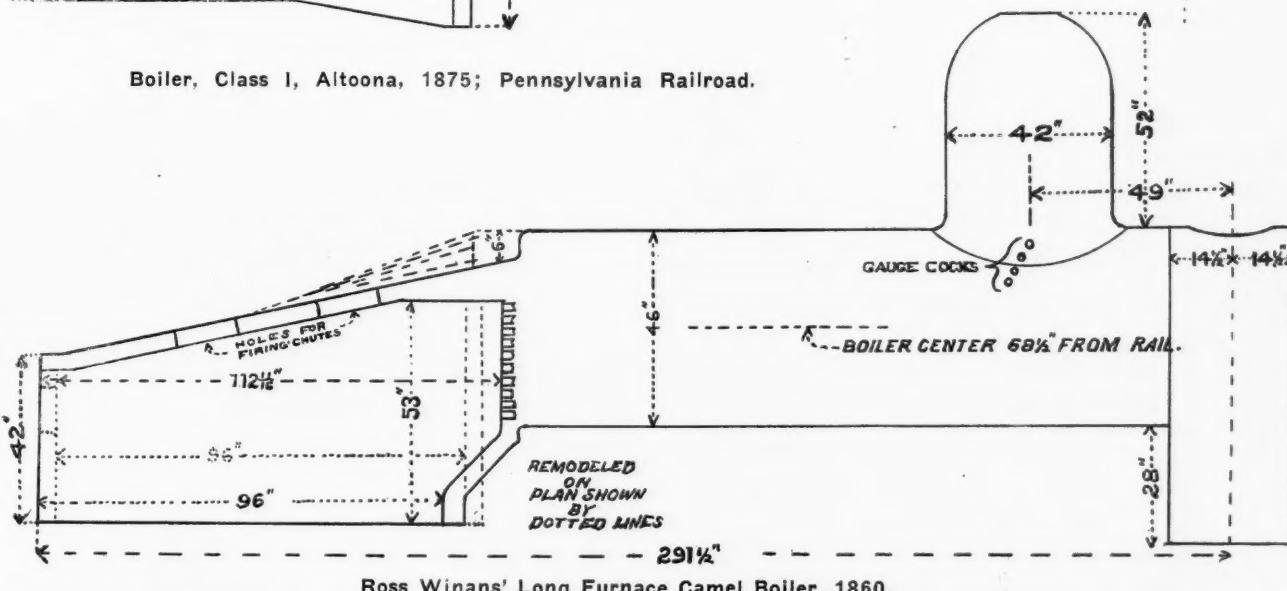
affording a remarkably unobstructed view of the line and its surroundings in every direction.

These features, to some extent, characterized the Milholland engines as well, and in both cases were far superior to the ordinary boiler with a short firebox extending but a few inches into the cab.

In the sloping firebox the use of staybolts between the crown and roof sheets is superior to the more intricate crown-bars and sling-stays prevailing in the round-topped boilers of either straight or wagon-top pattern; and even with the advent of radial stays for such boilers, the tapping of the holes for the staybolts could certainly be done in a manner tending toward greater efficiency in the type with roof and crown sheets more nearly on the same plane. Of course, this remark could not apply to the Belpaire firebox, but at the time



Boiler, Class I, Altoona, 1875; Pennsylvania Railroad.



Ross Winans' Long Furnace Camel Boiler, 1860.

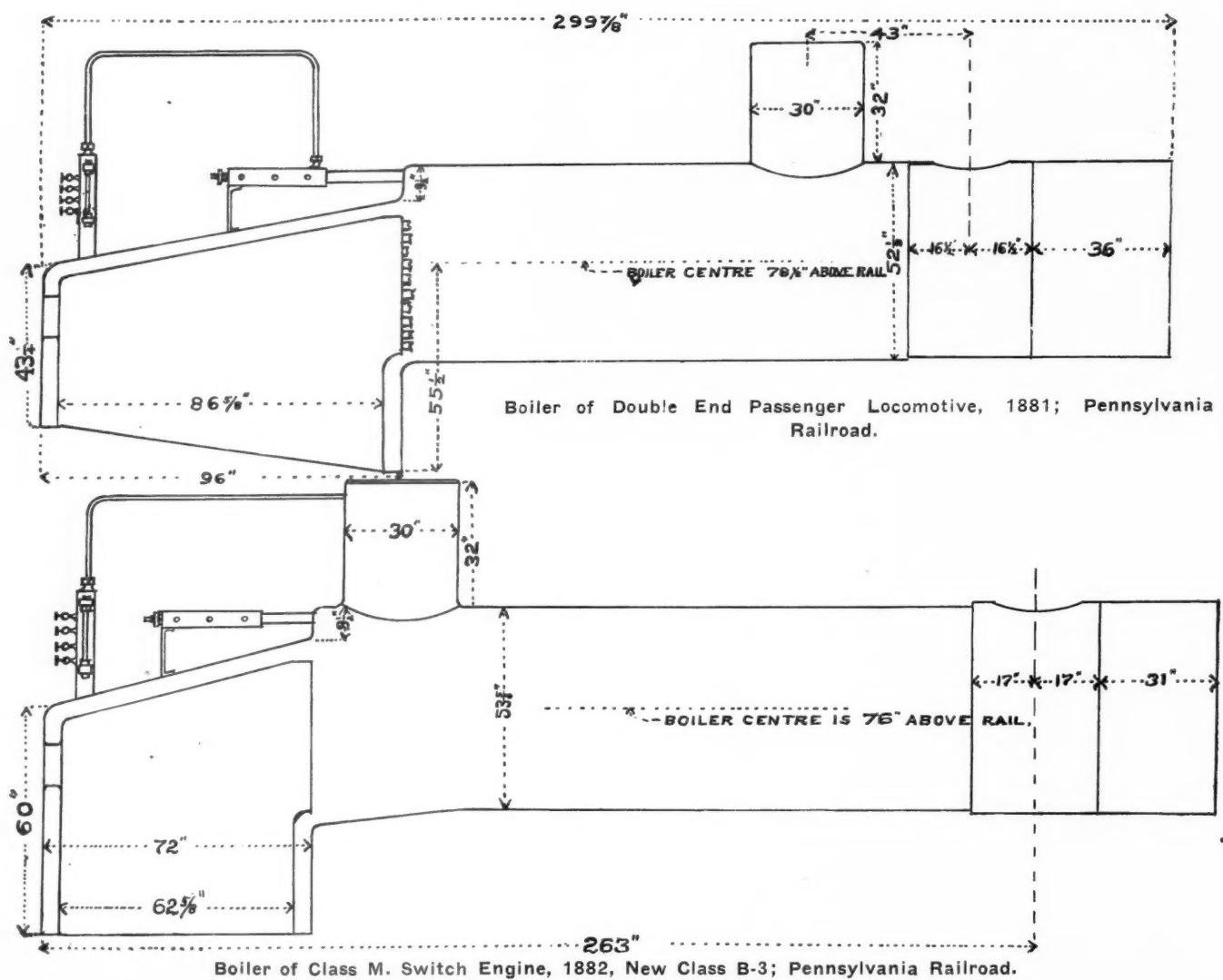
been considered sufficiently great. The Pennsylvania always adhered to the design originated in the Rocket and improved by Ross Winans, except in their last "Altoona" boiler which, being a modified Belpaire, preserves, at least laterally, the parallel roof and crown sheets, as the former is here attached to the waist by a hip sheet of the same type as that of the regular Belpaire firebox, even though the front of the roof-sheet and top of the waist are practically flush.

It has been intimated that the primary object of the sloping firebox is to decrease the weight at the rear end of the engine. The benefits also arising from the more simple and effective means of uniting the roof and crown sheets and of keeping them in as nearly parallel planes as possible, were probably seen later. To these the Pennsylvania designers added, in their various types of these boilers, a superb arrangement of the boiler mountings for convenient handling, and cabs

of the earlier use of the radial staybolts, the Belpaire had not been adopted to any noticeable extent on either English or American railroads.

Superior steaming qualities have been claimed for the sloping firebox, but authorities are inclined to question this. These persons claim that the great reduction of the water space causes difficulty in carrying water at a proper working level, and develops a tendency to draw the water away from the crown-sheet when the engine is running on a comparatively full-opened throttle.

With regard to the steaming capacities of such boilers, some years ago the late M. N. Forney made an investigation of the Pennsylvania class I engines, and from data obtained came to the conclusion that they were somewhat deficient in this respect. He was evidently unable to account for this, as he states that similar boilers of the Ross Winans' "Camel" en-



Ross Winans' Camel, No. 131; Baltimore & Ohio.

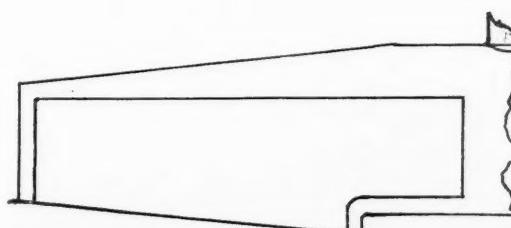
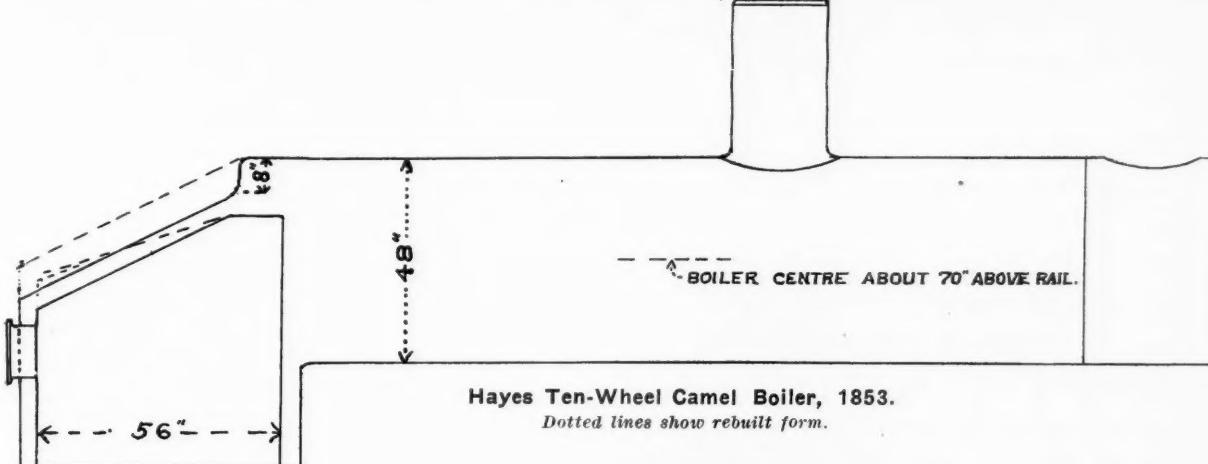
Showing style in which these engines were rebuilt and run by that company during the latter years of their service. The change in the slope of the roof-sheet is especially noticeable.
This photograph was taken at Cumberland, Md., in 1892.

gines, the building and operating of which he had formerly been so familiar, were excellent steamers and gave very little trouble in maintaining a proper water level.

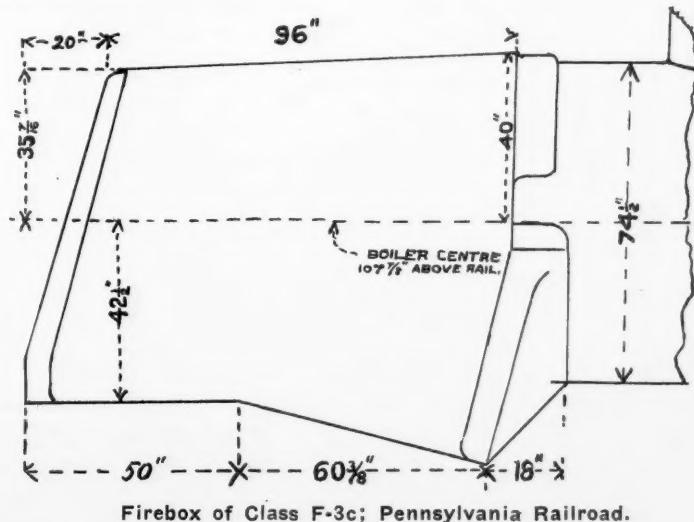
It will be observed, however, in comparing the drawings of these two types of boilers that on the "Camel" the dome was 42 in. in diameter and was placed at the very front end of the barrel with the gage cocks immediately below it. Neither was a glass gage used, while with the Class "I" both glass and compression gages are used, and these are attached to a brass water-column fastened on the roof-sheet at the rear and connected to the dome by a circulating pipe at the top. The dome of the "I" was also just in front of the point of union between the sloping roof-sheet and the barrel, so that these differences in construction perhaps only revealed conditions which prevailed in both types of boilers, but were not shown so plainly to the enginemen of the camels, and for this reason

having even been used for some time in 1884 to haul a heavy suburban accommodation running between Wall (now Pittcairn), and Pittsburgh. It was difficult to run this train on time with standard passenger engines, on account of difficulty of starting promptly at each of the numerous stations, many of which were located on quite heavy grades. The "I" not only started the train so quickly that several commuters who had waited to get on the train until the smoking-car reached them, found themselves left standing on the platform as the coach swept by. The schedule speed was easily maintained between the stations, the only trouble being in the rapid wear of the driving boxes on account of the small diameter (50 in.) of the driving-wheel. There was no difficulty in obtaining sufficient steam.

Of the performance of the "camels," I have seen but little, as their service on regular freight trains was largely ended



First Wootten Firebox, 1877.



it is more than probable that most of the men running the "I" engines are inclined to carry water a little too high through a fear of burning the crown-sheets, induced by the variations in level shown in the glass while running. I have in the past frequently observed the water disappear entirely from these glasses and after a brief interval not only return, but rush swiftly to the top of the glass and probably some distance further up the pressure pipe, while running, and continue this vibration for some time, yet when the engine was stopped the water would almost always be found at a proper level.

I know of comparatively few of these class "I" engines coming in with burnt crown-sheets, and do not know that any one of the large number at one period on the Pennsylvania and its branches, ever exploded a boiler, and coming in very close contact with many of the type between 1875 and 1885 I usually found them satisfactory as "steamers," one

before my school days were over. However, one day in 1892, I saw the long firebox camel No. 118 of the Baltimore & Ohio, already referred to, pushing a heavy freight train, with a standard B. & O. consolidation at the forward end, up the steep grade having a sharp curve leading to the bridge at Benwood, W. Va., and keeping more than one-half of the cars together at the buffers. In fact, before the bridge was quite reached, the larger engine had to stop to bring its steam up to a suitable working pressure!

Before closing, references to two of the engines embodied in the preceding may not be amiss.

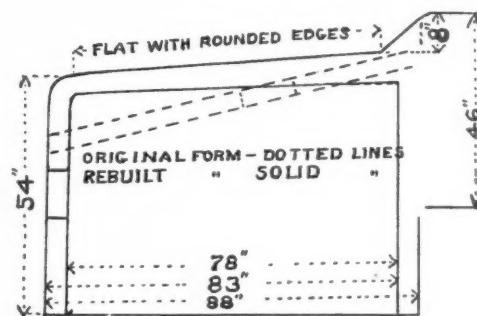
The boiler built at Altoona in 1881 for the "double-ender" passenger engine was used for ten years, at the end of which time the engine was retired from service, not from any fault of the boiler, but because of the general unsuitableness of the type of engine not justifying its rebuilding. The only remark I ever heard in connection with its boiler, was that of an

official. Some time after it had been placed in service, he said that it was a mistake to have used only 17 in. cylinders on it, and this man would scarcely have expressed himself so had the boiler been deficient in steaming qualities.

The other engine to which I would again refer is the Rocket. It may be interesting to many to know that in 1876 the London & North-Western published a handsomely prepared volume, minutely describing the scenery along its various lines, together with a history of the company and description of its shops and equipment; on page 27 is shown a wood-cut of the Rocket, which the author states, represents that engine as it now stands in the South Kensington Museum,

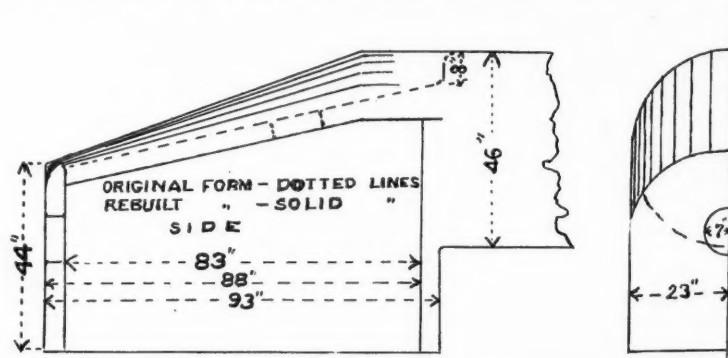
that the location of this engine in the South Kensington Museum was not known to me until after my last trip to England, or I should have been qualified to confirm my idea that this cut shows the engine at the time of its retirement from service, and that the makers of the reproduction sent to the Chicago Fair deemed it better to follow the design as built for the Rainhill contest.

It was only after a very careful consideration that the Rocket was selected as the initial point in the history of the sloping firebox, instead of the Ross Winans camel. In the familiar drawings of the Rocket there is shown uniting the inclined sheet to the boiler, a flat sheet only a few inches



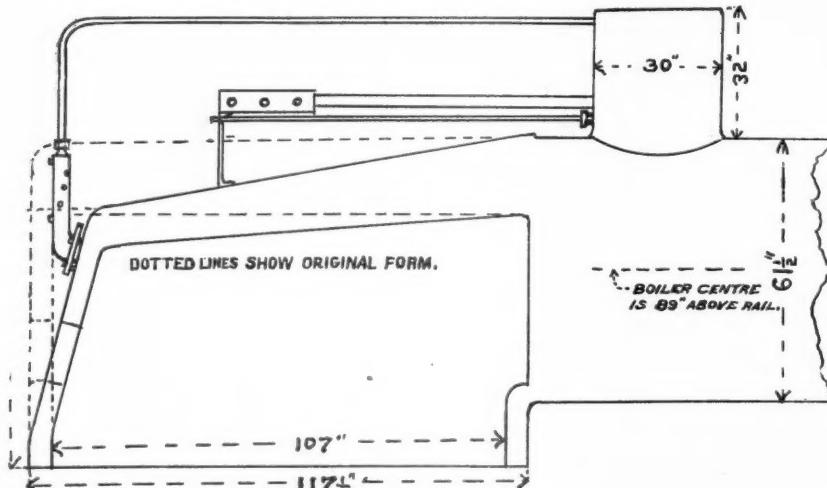
Firebox of Seneca, No. 131; Pennsylvania Railroad.

London. Examination of the illustration accompanying this article, which is made from my reproduction of the cut referred to, will show quite a difference between it and the drawings usually published; in fact, I have never seen that of the London & North-Western book shown in any other publication. As the Rocket remained in service for many years, it was certainly in the shop from time to time for general repairs, and it is very probable that the results of these repairings are shown in the discrepancy in appearance of the two drawings. It will be noticed that the museum drawing shows a smokebox in place of the curved base by which the



Short Firebox of Camel, 1850; Baltimore & Ohio.

long which some might assert is the roof-sheet and claim that the sloping portion is only an inclined end-sheet, but as the flat sheet is apparently no longer than many throat-sheets, and as a short end-sheet appears at the bottom, I felt justified in designating the larger sheet as the roof-sheet, or in any event as a combined roof and end sheet. The location of the fire door in it does not take away its right to the name any more than does the placing on the roof-sheet of the Winans Camel, of the holes for the auxiliary firing chutes deprive that portion of that class of engines of its right to the name of roof-sheet. The reasons for building the firebox of the

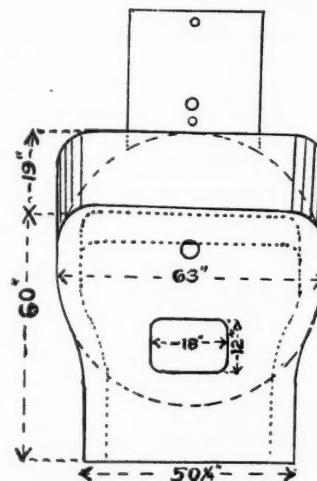


Altoona Boiler, 1903, Classes H-3d, H-3e, and H-3f; Pennsylvania Railroad.

smokestack is attached to the front tube sheet in the usual drawings, and the cylinders are set at a greatly reduced pitch, while the former sloping top or roof-sheet of the firebox is almost, if not entirely, level. Although the Rocket in this form is entirely foreign to the subject of this article, it is introduced partly as a matter of interest suggested by its earlier conformity to the design of boiler under consideration, and partly to suggest that those in charge of the repairs referred to probably found that in so small a boiler its extreme slope, too, seriously reduced the water-space; but if so, the later firebox does not indicate that any very drastic measures were taken to remedy the trouble. I much regret

Rocket in the form shown, are unquestionably the same which impelled Winans and the later designers to use sloping roof-sheets in their locomotives.

It is rather singular that no safety-valve is shown on the illustration from which this reproduction is made. All other drawings of the Rocket show a casing near the rear of the boiler which evidently covers that important adjunct of every well-regulated locomotive, but nothing can be seen in the sketch referred to, indicating its existence. It is possible that the casing had been long removed and that the artist or the engraver, overlooked the valve, as it no doubt stood but a very few inches above the boiler.



PRE-COOLING PLANTS IN THE SOUTH.

BY JOSEPH H. HART.

Probably no phase of the commercial development of the southern states to-day is a matter of such vital importance as that of railroad transportation. When this latter feature is combined with that of cold storage and involves the transportation of perishable products the matter becomes of the highest importance. The modern railroad to-day, even in the most developed sections of the community, appears hopelessly inadequate in the performance of its duty in the conveyance of freight and especially that of the perishable character. The application of mechanical refrigeration in railroad work has progressed to a very slight extent and represents one department in the application of mechanical refrigeration in which the utilization of mechanical refrigeration has proved inadequate or unsatisfactory at least in a number of its applications. Thus the mechanical refrigerator car has not as yet been an industrial success and the railroads show an absolute disinclination to avail themselves of this unit largely for good and sufficient reasons, namely, its unreliability and inefficiency as at present constructed. In reality, all perishable products are conveyed by icing and ventilation almost exclusively and a large portion of this ice as furnished by the railroads is of the artificial variety, and this condition holds almost exclusively in the South. The remarkable car shortage existing in the railroad world a few years ago, the accumulation of freight and the charges of discrimination in the privileges accorded to shippers in the furnishing of facilities for transportation have led to a number of interesting developments. Again, the fact that cold refrigerator cars are not in continual use, that their demand is limited in time and that special speed must often be made with this type of produce has resulted in an immense loss to many of the communities. Home facilities for cold storage and warehouses are a matter capable of solution by every community in the southern states, but when the situation infringes on that of railroad transportation generally the problem becomes complicated. Not only are the refrigeration facilities furnished inadequate, but the methods of loading and cooling and transportation involve great loss.

The difficulty is not entirely with the transportation companies. Eight years ago by prompt loading and unloading of cars they were able to get from the cars in service from 28 to 40 miles per day car movement. To-day, owing to the limited terminal facilities and often to the absence of prompt delivery and unloading by the consignee, the total car movement has been reduced until it stands at from 16 to 22 miles per day, and this latter feature can only be improved by co-operation of the various parties. Of course, the transportation of perishable products occurs at a much greater rate, but the same or similar conditions hold in this, and the total car movement in this department has undergone a decrease in approximately the same ratio.

Again, the situation of mechanical refrigeration and natural ice in the railroad world in general and in the South in particular has not been such as to eliminate any of the difficulties involved, but rather to augment them and present additional ones of its own. Almost every shipper can tell of experiences whereby perishable products, fruit or vegetables of one kind or another, have been held up in transit or before unloading without proper cold storage facilities or with inadequate ones. As an interesting illustration it can be said that the majority of perishable products are furnished to railroads for transportation in cold storage at normal temperatures, and they often reach their destination before having undergone simple pre-cooling or preparation for cold storage, the decaying effects having continued throughout transportation at a more or less reduced rate. The greater part of the fruit of the South is shipped under two general systems, namely, ventilation in the winter and

early spring when the temperatures are low, and ventilation and icing later on. When the fruit is shipped in refrigerator cars with the ventilators left open, currents of air circulate through the car when in motion and eliminate the deteriorating effect of moisture present to a greater or less extent, although the heating is often pronounced. When the temperatures are higher the ventilators are often closed and the tanks kept filled with ice. There is objection either way and the result desired is a mean where the evils arising from moisture present due to non-ventilation and the cooling effect required strike the best average. A good ice tank should possess a certain amount of circulation, and if this is adequate the moisture will be condensed as fast as formed and not prove very objectionable. The cars cannot be filled, however, in order to permit of circulation, and this represents a distinct loss.

The installation of pre-cooling plants for the preparation of freight and vegetables before transportation is a phase in the application of refrigeration to the transportation business which is rapidly attaining unusual proportions. A number of interesting results in regard to the effect of pre-cooling and the absence of this feature in railway transportation have been fully set forth in a bulletin in the process of publication by the Bureau of Plant Industry by the United States Agricultural Department. Under best conditions for pre-cooling it takes from 18 to 24 hours to cool oranges or other fruit in bulk to a temperature at which decay is impossible, and even under these circumstances portions of the fruit are cooled considerably below the danger point at which freezing occurs. In the average shipment of oranges from California cooling occurs at such a slow rate with natural ice refrigeration that the oranges often arrive in New York before the pre-cooling stage is complete or the processes of decay stopped. Being then transferred to cold storage warehouses they receive during this process an increased impulse toward decay, augmented very greatly by the fact of their previous condition for a comparatively long period. The result is that their resistance to the ordinary processes of decay is much diminished, and even if maintained in cold storage they do not possess the quality obtainable from fruit placed immediately in cold storage, and this latter feature is especially noticeable in their keeping qualities. Thus both from the shipper's and consignee's end suitable refrigeration in transportation has become almost an absolute necessity, and this satisfactory refrigeration, at least for temporary conditions and conditions capable of alleviation, can be produced by the installation of suitable pre-cooling plants. Government experiment plants exist in California and the South and a number of railroads have erected plants of the pre-cooling type in both sections. The chief difficulty in this process of pre-cooling is the time which must elapse in order to accomplish this. Generally from 18 to 24 hours is required to cool oranges or other fruit in bulk to a temperature at which decay is impossible, and even under these circumstances the refrigeration is unsatisfactory owing to abnormally low temperatures in certain sections. Wherever installed, however, these plants will undoubtedly prove a commercial success not only on account of the saving in shipments due to diminution in decay and the better quality of the shipment after transit, but on account of a large number of other factors which enter as well in limiting the efficiency of the transportation process.

Thus, pre-cooled fruit requires less ice for its transportation, since the sole duty of the ice under these circumstances is to maintain an initial temperature. It is even advocated that pre-cooling be used during the period when ventilation is the prevailing method and icing is not necessary. With pre-cooled fruit, packing can be much closer and ventilation is not nearly as necessary and need not be as thorough. Thus, oranges have been recently shipped to New York city in car lots of from 549 to 584 boxes each, an increase of more

than 40 per cent. over the standard car of 384 boxes. This increase in capacity is due not only to closer packing, but higher packing as well. In many refrigerator cars during the icing period it is impossible to fill the car on the top tiers without very considerable loss due to the fact that the temperature is much higher at all times in the top of the car than in the bottom. With pre-cooling and ventilation only during the average rise in temperature at the top of the car is from 8 to 10 degrees and the bottom about half of this. Even with this rise in temperature the average temperature of the fruit on arrival is usually lower than it is in cars under standard icing and the same conditions of weather and temperature.

This development of pre-cooling fruit before shipment is undoubtedly bound to be of increased importance in the near future. The saving of ice for icing, in space for shipment, in inefficient labor in handling the ice and in improved quality of the shipment after transit, are the main features which determine this result.

Pre-cooling plants consist of several distinct types, the car cooling unit and the package cooling type. In the former the cars are packed for shipment in the ordinary way and run on tracks into a refrigerating apartment, where they are cooled in a number of ways. The United Fruit Company has a number of interesting plants of the former type for the refrigeration of bananas during transportation, and by utilizing pre-cooling plants have been able to eliminate refrigeration in transportation entirely. Bananas, however, represent a comparatively easy phase of the problem for solution, maintaining their condition best at a temperature of from 55 to 65 degrees. However, this is from a refrigerating capacity viewpoint alone, since they are a very delicate fruit which when once ripe cannot be prevented from decaying and for this reason are always cut green and shipped to this country. A large proportion of this fruit is landed in New Orleans and shipped all over the country and takes from eight to 10 days to deliver it in various sections. A typical plant is that existing at Springfield, Mo., and consists of a train shed with four lines of track capable of cooling 10 cars each. A large refrigerating machine cools off, by means of brine circulation, large quantities of air which are conducted by overhead troughs along the top of the cars and connected by canvas chutes to the various ventilator openings. By this method of air cooling the cars can be reduced from about 75 deg. to 60 deg. in 12 hours. They can travel for about two or three days before the temperature rises to the danger point again. In Los Angeles a somewhat similar plant exists for the pre-cooling of oranges in car lots. The Southern Pacific and Santa Fe Railroads in this section have developed a number of types of pre-cooling plants and private interests have entered the field, and there is one or two government experimental plants in this section and in the South as well. An ordinary cold storage plant is in reality a pre-cooling plant of one type; it employs the package system. The freight or commodity should be installed in the cold storage plant house two or three days before shipment, but this involves the handling of the material twice and a considerable loss on this account. The train or car system of pre-cooling is undoubtedly superior from an efficiency point of view, although it requires a slightly longer time for the production of the required temperature. The chief difficulty in the pre-cooling plant is due, from an economic viewpoint, to the fact that its duty is essentially temporary and that it must have a large capacity due to various overloads at certain times. Thus one railroad system was recently compelled, in California, to ship in about 20,000 tons of ice to take care of about 20 per cent. additional of the citron industry, the shippers of which had decided to use icing instead of ventilation. This represents the chief phase of the difficulty from the railroad viewpoint, the variability of the demand and the character of it at the option of

the shipper. Under these circumstances satisfactory results can be attained only by municipal endeavor. A very large number of the smaller communities throughout the southern states have their own ice-making plant and cold storage warehouse and the installation of a pre-cooling addition to this represents a phase for legitimate progress. Again, it is undoubtedly a function of such communities to see that the terminal facilities are adequate to meet the demand, since in some respects it seems entirely outside the province of railroad work, or at least beyond the satisfactory solution by them under present economic conditions. The fact that in some localities more especially favorable the railroads have gone ahead in the installations of such plants is additional warrant for their good faith in this business and their attempt to install satisfactory working conditions. One of the chief difficulties at present arising from the outcry against the railroads in regard to discrimination on account of car shortage and terminal facilities has resulted in an attempt to give all parties equal service with the result that none is satisfactory and the general car movement has been much reduced due to readjustment at division points with this object in view.

That the problem to the railroad is an essential one is without question. Not only cannot the demand for refrigeration be accurately foretold from crop conditions, but immediate weather conditions enter as well. The requirement for railroad refrigeration is for an extremely mobile and transportable refrigerating plant embodying all the increased efficiency of the mechanical refrigeration system in the production of the icing and one capable of operating in large units and under what are often regarded as inadequate conditions by the refrigerating engineer. Results can only be attained by the co-operation of the various communities among themselves and in conjunction with the various railroads involved in the problem as well.

ZONE TARIFF ON THE HUNGARIAN STATE RAILROADS.

In 1889 the state railroads of Hungary put a zone tariff into effect that attracted a great deal of attention all over the world. It has been estimated from time to time that it was not giving the best of satisfaction, and recent reports on the subject go to confirm this rumor. There are in all sixteen zones. The first fifteen cover a distance of 400 kilometers (248 miles) and the sixteenth the balance of the distance to the frontier of the country.

There are several objects in view in the introduction of the zone tariff. First, there was the sale and handling of tickets which was thus greatly simplified and facilitated to correspond to the zone, for before the introduction of the system the price had to be calculated for all distances. Then there was a desire to lower the rates, and this lowering increased for long distances, reaching uniformity for all beyond 400 kilometers. This was done for the purpose of developing a taste for long-distance travel, and with the hope that it would result in an increase in the revenues of the state railroads. Finally there was a desire to secure the concurrence of the private lines in these low rates. These various results have been attained.

The manipulation of the tickets has been simplified, for the actual number of tickets to be handled has been greatly reduced, and the same holds true of the tariff sheets, despite the numerous modifications to which it has been subjected since its inception. But, on the other hand, the zones have given birth to numerous ticket frauds, and the increase of expense of operation entailed by the increase of traffic has not been followed by a sufficient increase of receipts to meet these additional expenses. So that, from a financial standpoint, the results of experience have not been favorable to this method of regulating rates.

In other respects, too, the tariff has brought down upon

itself adverse criticism at home, as witness that which recently appeared in the *Zeitschrift des österreichischen Ingenieur und Architekten Vereins*.

Here the opinion is expressed that a careful examination of this zone tariff would carry the conviction that, in its present form, it is unjust to the traveling public and unprofitable to the state railroads. This writer holds that the principle obtaining in the sale of merchandise should be followed also in the sale of transportation; that is, the greater the quantity bought the lower the price per unit of measure. He then goes on to show how, from the schedule of rates and the length of the zones, the rate per kilometer actually rises up to the eleventh zone, and that the only point in favor of this classification is to be found in the reduction in rates that occur in the last three zones. But even this is not exempt from adverse criticism, for though they are isolated and have a rate intended to reduce the fares for long-distance travelers the advantage is partially destroyed by the fact that, though they are of different lengths they are given the same rate. The result is that the fare to the passenger who makes 226 or 301 kilometers is the same as that to the one who makes 300 or 400 kilometers, respectively. Furthermore, these long zones offer themselves very readily to the perpetration of fraud. It is upon the basis that has thus been outlined that the writer concludes that the zone tariff as in vogue on the state railroads of Hungary does not render an equitable service to the traveling public, nor one that is lucrative to the management, and is very far from offering such advantages as to develop a taste for travel.

RAIL FAILURES—MASHED AND SPLIT HEADS.*

BY M. K. WICKHORST.

Engineer of Tests, Chicago, Burlington & Quincy.

During the last year or two considerable attention has been given to steel rails, their service performance, failures, design, specifications, etc. This paper is given as a contribution to the general subject and deals with one kind of failure known as



Fig. 1—100-lb. Rail With Split Head.

"mashed" or "split" head, and is generally known to trackmen as "piped" rail, although it is in most cases not a piped rail properly so called. I desire to show up this type of failure in relation to segregation.

Fig. 1 shows an etched section of a 100-lb. rail which failed

*From a paper read before the American Society for Testing Materials, Atlantic City, June, 1908.

due to the mashing and splitting of the head. This kind of failure first shows itself to the trackmen by the development of a dark streak along the head of the rail from several feet to several yards long. At the same time the head starts to sag down on one side or perhaps both sides, spreading somewhat at the same time. The section illustrated in Fig. 1 was from a 100-lb. rail laid about October 15, 1907, taken up December 27, 1907, being in service approximately 70 days. The marking indicated it to be the top rail of the ingot. It was laid as the outside rail of a three degree curve and was the seventh rail from the beginning of the curve. The rail was removed on account of a black streak showing on the head of the rail, and in addition to this black streak there could be detected by the eye a sunken portion on the outside part of the head about two or three feet from one end and extending over a length of 6 or 7 ft.

Chemical tests were made from two different samples of this rail, one being taken from where the head seemed to be

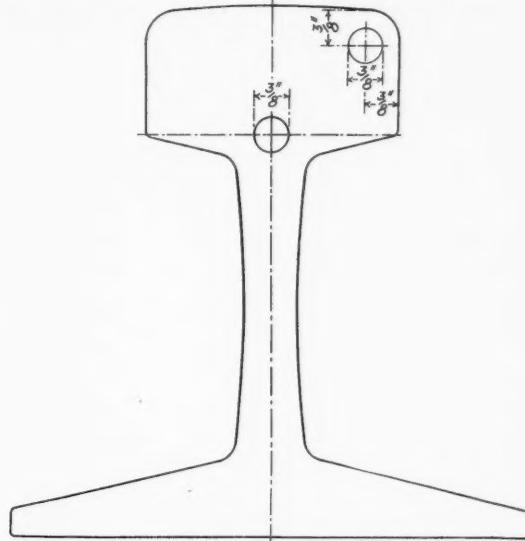


Fig. 2—Borings for Analysis.

in the worst condition, which was 5 ft. 6 in. from the leaving end; the other being taken off the other end of the rail where it was apparently in good condition. These sections we will call "A" and "B" respectively. From each section borings were taken parallel with the length of the rail, one sample in each case being taken from an upper corner of the head and the other sample from near the junction of the head and the web. The borings were taken about as shown on Fig. 2. The results of analyses are shown in the following table:

	Carbon.	Phosphorus.	Sulphur.	Manganese
A—Head . . . . .	.51	.082	.060	.124
A—Web . . . . .	.81	.117	.152	.138
B—Head . . . . .	.56	.119	.076	.141
B—Web . . . . .	.64	.163	.114	.155

It will be noted that there was very considerable segregation of the carbon, phosphorous and sulphur in both cases. In addition to the chemical analysis we made some tensile tests of a piece taken close to sample "B," which are of interest. Two of the pieces were transverse pieces taken from the middle of the head and from immediately below and called samples "1" and "2," respectively. The third test piece called No. "3" was a longitudinal test piece taken from the middle of the head and was the usual test piece $\frac{1}{2}$ in. in diam. by 2 in. gauge length. Results of these tests are given below:

	Transverse Test Pieces.		Elongation. None.
	Dimensions .696 x .292 in.	Tensile strength, per sq.in. 50,095 lbs.	
No. 1			
No. 2 . . . . .	.507 x .293 in.	58,600	None.

	Longitudinal Test Piece.		Reductio. 7.0
	Per sq. in. Elastic limit. 77,200 lbs.	Tensile strength, in 2 in. 108,250 lbs.	
No. 3, .505 in. diam.	5.3		

It will be noted that while the longitudinal test piece shows a good tensile strength, the elongation and reduction in area

are very low. The transverse tests show low tensile strength and no elongation.

From the above examination, the splitting of the head is probably to be explained as follows: The load comes on the head of the rail more or less to one side due to the wear of the tread of the wheel or canting of the rail, which introduces transverse tensile stresses in the head of the rail, being greatest at the top. On account of the bad segregation and the consequent of the weak condition of the metal, the material is unable to withstand the internal tensile stress and a crack develops internally which gradually keeps on developing until it finally breaks through on the under side of the head where it joins the web. The top surface of the head for a depth of about $\frac{1}{4}$ in. being of normal composition and having the effect of the rolling is in good physical condition and it flows instead of developing a crack which explains why the crack starts internally about $\frac{1}{4}$ in. below the top of the surface.

THE ANTHRACITE-TIDEWATER CANALS.*

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The coal-carrying canals were constructed during the period of great national interest in the opening of water routes to the West. Unlike the larger projects, they were intended to supply transportation to a special interest, and upon the development of that interest—the coal trade—depended their whole prosperity. Their construction took place at a time when public interest in waterways was at its height. Into the history of each enters much of the speculative element which attended the construction of all the early projects for furnishing cheap outlets for the undeveloped national resources. With the advent of the railroad as a transporter of coal their operation was found less and less profitable, and they have gradually dropped out of importance as industrial agents.

It is the object of this paper to review the history of these waterways and to summarize the conditions which determine whether or not they may again become available under the new economic conditions which have developed or seem likely to develop.

THE DELAWARE & HUDSON CANAL.

The construction of the Delaware & Hudson Canal was authorized by the joint action of the legislatures of Pennsylvania and New York in the sessions of 1822-3. The company became a banking concern and a large landholder—the latter through the desire to control tonnage for its waterway.

The period in which the project was launched was one of great speculation in public improvements, and the stock was subscribed to the full amount by 2 o'clock of the first day on which the books were opened. The original plan had been for a canal and slackwater navigation, but an improvement, to consist of a canal alone, and finally of a canal and a railroad was substituted. The first through shipments of coal took place early in 1829. The coal was brought down to the canal from the mines at Carbondale at first by teams at a cost from \$2.25 to \$2.75 per ton; later a substructure of timber faced "with rolled iron plates . . . fastened . . . with screws" was used. The coal traffic on the canal in its early years received an important supplement from the general trade, which was a greater factor than on any of the other coal canals; but the income from it never equaled the running expenses of the waterway. The coal market was so limited that not until after the results of the panic of 1837 had disappeared was the company able to declare dividends.

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†The historical material used in this article is summarized from a monograph preface for the Carnegie Institution of Washington by the author.

Then the trade necessitated the enlargement of the waterway—originally intended for 30-ton cargoes, and it was improved to accommodate $40\frac{1}{2}$ tons in 1844, 50 tons in 1846, 98 tons in 1850, 140 tons in 1853. Meanwhile the railroad to the head of navigation had undergone several improvements to increase its capacity. In 1847 the first important contract was entered into to get the coal of other companies, thus greatly increasing both tonnage and tolls.

In the years following 1840 the company enjoyed a period of great prosperity. In 1843 all outstanding bonds were paid. By 1845 almost all the banking capital had been redeemed and the loans of credit by New York were canceled in 1848 and 1850. This left the company entirely free from debt. Soon after, however, the desire to expand to other markets led to the construction of railroads and to new bond issues. The greatest railroad expansion comes, however, after 1861, and up to 1865 the stockholders found their canal a rich source of income. How valuable a property it was may be judged by the following typical instances of dividends received: 1840, 11 per cent.; 1847, 22 per cent.; 1855, 18 per cent.; 1858, $5\frac{1}{2}$ per cent. (due to railroad expenditures); 1860, 7 per cent.; 1861, 9 per cent.; 1862, $11\frac{1}{2}$ per cent.; 1863, 34 per cent.; 1864, 31 per cent., and 1867, 16 per cent. The decrease after 1864 was due to the transfer of much of the tonnage to railroad routes. The prosperity was due in large degree—in fact mainly—to the toll on coal of other companies. The first contracts for this service were made in 1849, and soon furnished an important part of the income. By 1854 the tolls paid by the Pennsylvania Coal Company, the chief independent company, for the year amounted to \$541,378.07.

An unfortunate dispute as to this traffic arose as to the tolls chargeable after the enlargement of the canal. The contest was taken before the courts in 1856, and it dragged on until 1863, when the court gave an award for the Delaware & Hudson Canal Company amounting to \$350,000. The legal victory was, in fact, a great economic misfortune. After the adverse decision the shipping of coal by the canal was cut off by the independent company, and its traffic turned to the Erie Railroad, which, in 1866, carried almost all the coal formerly sent over the canal by the Pennsylvania Coal Company. The diversion of this traffic dealt a deathblow to the prosperity of the canal. In the two years 1865 and 1866 the company lost more than the entire amount of their claim for extra toll, and the canal income fell from about two and a half times the expenses for repair and maintenance to a little over one-fourth of their amount.

At once the policy of the canal company was changed. An attempt was made to greatly extend their railroad holdings, and thus to win back the traffic they had lost and to obtain access to new markets. In 1867 a railroad outlet through Scranton was secured by the absorption of the Union Coal Company. Another company, with coal lands and a railroad connection across the Susquehanna, was purchased, giving an outlet to Baltimore and to Jersey City. In 1868 a contract with the Erie was made to build a line to give access to the Rochester and Buffalo markets. Other branch roads were provided for, and an exchange of stock with the Erie brought about the identity of interests of those two companies. The Albany & Susquehanna Railroad was leased in perpetuity in 1869, and further access to Baltimore acquired. Three years later the New York & Canada Railroad was put under construction to tap the Montreal market.

By the time of the panic of 1873 the company was in the full swing of the expansionist movement. Railroads had superseded the canal in the transportation interests of the company. How thorough had been this transformation in the five years since 1867 is shown by the fact that by 1872 all statistics of canal traffic disappear from the reports and the only regular mention of the canal is in the entry of canal tolls in the income sheet.

The history of the canal since 1872 is an uneventful one of decline and abandonment. The coal shipments were practically confined to those made by the company and fell off yearly. In 1897, preparatory to final abandonment, a part of the canal assets were charged off to profit and loss and subtracted from the surplus. The following year the "managers . . . decided . . . to cease operating the canal . . . the cost of transportation is too great as compared with other methods." Since then the damages made by freshets have not been repaired and "the cost of the canal . . . has been charged off and no longer stands as an asset."

THE MORRIS CANAL COMPANY.

Least successful of the coal carrying waterways was the Morris Canal—one which, even had railroads not made competition by the route impracticable, would have had a hard time competing with the other water routes to the seaboard. The claims of the promoters of the enterprise were by contrast greater. They expected the Morris Canal to secure a monopoly of the trade of the west to New York, to control all the coal trade from the Lehigh region to tidewater and

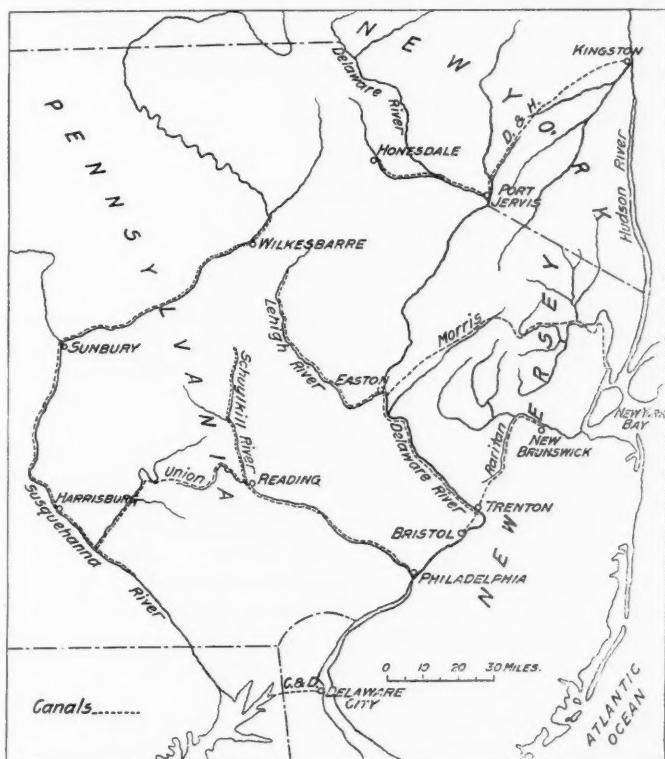
next period of speculation preceding the panic of 1837. Additions to stock authorized by the legislature in 1835 were eagerly subscribed for, the forfeited shares were easily sold at par, and in 1836 with this money the canal was completed to Jersey City. The directors boasted that in one year their financial operations had put the company in a position to discharge all debts "from their own capital and resources" and still have \$1,000,000 for banking purposes. These finances, however, were largely concerned with "notes of other banks equal to specie," and when the panic of 1837 came it forced the company again into embarrassment.

A 25-ton canal, it was evident, was inadequate to maintain itself. Enlargement to a capacity of 54 tons was attempted, but while the improvement was still only under way the company was forced into bankruptcy, and in 1844 was sold to satisfy a mortgage.

The purchasers reorganized the company by consolidating the old common stock and issuing preferred upon which dividends of 10 per cent. were guaranteed. The new company continued the improvements on the canal and the enlargement of the planes which, when they were acquired, passed boats only at one-fourth the speed of the lift locks. Up to this time no development such as had been hoped for in the through coal trade to tide had taken place. In 1847 even, only 17,885 tons reached Newark, and upon all through trade there was no profit. An enlargement to 70-ton capacity was next attempted. By 1856 most of the planes on the west slope, where the chief lifting was to be done, had been enlarged and a depth of 5 ft. of water attained. At last the tide seemed to have turned—the canal had been quadrupled in capacity and boats could be passed carrying 65 to 70 tons. Shipping facilities on the Delaware were improved and arrangements made to get coal from the Lehigh Valley Railroad as well as from the Lehigh Canal. Finally, in 1859, the sale of the Delaware division by the state of Pennsylvania to a private company made possible a combination as to toll rates which promised increased income.

The outlook for the Morris Canal at the outbreak of the Civil War was therefore more encouraging than at any other time during its history. The war period proved for it, as for other coal-carrying routes, a period of rich harvest. The total tonnage rose from 554,034 tons in 1858 to the high-water mark of 723,927 in 1864. More coal was offered than could be carried, though the boats were pressed to the limit of their capacity. The coal tonnage rose from 350,331 tons in 1859 to 459,175 tons in 1866, an increase which, with the rise in tolls, brought dividends never before or afterward approached in the history of the company. The highest profits were reached in 1864, when 10 per cent. was paid on both common and preferred stock. The period of prosperity was soon brought to an end. The railroads, heretofore the feeders of the canal, now became its competitors. This influence first began to be felt in 1866, when the Morris & Essex Railway began to supply with coal part of the territory formerly reached by the canal. To counteract the competition new enlargements were put under way and special inducements offered to boatmen to stay on the canal in the coal trade. But the rail rates, especially the rate wars, soon cut off all profits, and in 1870 the company asked the legislature for permission to lease the canal and its properties. Permission was granted. Early in 1871 the Lehigh Valley Railroad leased the canal and its important terminal facilities in Jersey City for 999 years. The subsequent service rendered by the canal has been a decreasing one. Only in two years (1883 and 1884) after 1870 has the tonnage risen above 300,000 tons. By 1888 the trade had become "almost exclusively" local. The flood of 1902 on the Lehigh finally closed the western end of the canal, and it is now no longer open for use except for the local trade and for coal delivered to it by railroad.

By its original size and by the physical difficulties to be overcome the Morris Canal was from the first seriously handi-



Map of the Anthracite-Tidewater and the Susquehanna Canals.

to develop along its route the greatest manufacturing district of the new world. The canal was first projected as a state work, but in 1824 was given to a private company. The physical difficulties to be surmounted were greater than in any of the other projects. The rise and fall to be overcome was reported as 1,730 ft., a forbidding distance, of which 1,470 ft. must be overcome by inclined planes instead of locks.

The high tide of speculation at which the canal project was started brought offers of subscription of \$20,000,000 to the \$1,000,000 of stock offered in the spring of 1825. Public confidence soon fell away and by 1828 over one-third of the stock was forfeited, through non-payment of assessments. The financial straits of the company were relieved by loans abroad, but the work dragged, and the first boat did not pass to Newark until the fall of 1831. Even after the canal was in working order it was difficult to borrow money to fit out boats for use thereon. Financial difficulties continued until the

capped as a route for the through trade. The part it played was consequently a disappointing one.

THE DELAWARE DIVISION CANAL.

The object of this detached portion of the state works of Pennsylvania, unlike that of the system which was to tap the trade of the west, was to supplement works already under way—the Lehigh improvements, with which interests it has now become merged. It was thus built with the definite thought that its value should be found in service to the coal traffic. The waterway was constructed in the years 1827-1830 though navigation was still incomplete at the end of 1831. Faulty construction, bad judgment in determining the size to be given the canal and the interstate jealousies of New Jersey and Pennsylvania hindered the usefulness of the waterway. New Jersey was reluctant to yield the use of the Delaware as a feeder, and Pennsylvania forced traffic through an artificial route to Bristol for fear an outlet lock to the Delaware and Raritan would divert the profits from her citizens to those of New Jersey. The dimensions of the canal locks were but half those of the Lehigh, and transshipment was thus necessary, or the use of small boats suitable to the Delaware. Recommendations that the canal be made uniform with the Lehigh remained unheeded by the legislature until railroad competition began to threaten both the New York and Philadelphia markets. Then improvements were put under way, but were not completed when the canal was sold with the other state works undisposed of, to the Sunbury & Erie Railroad in 1857.

An independent company took over the canal the following summer and operated it for nine years. The improvement begun by the state was completed, but due to failure to come to amicable arrangements with the other waterways the canal did not share the phenomenal prosperity enjoyed elsewhere during the Civil War. The lack of harmony finally brought a proposal to buy the canal from the Lehigh Coal & Navigation Company, which was accepted by the Delaware Division Canal Company in 1866.

THE LEHIGH COAL & NAVIGATION COMPANY.

The plans to develop the mining lands on the Lehigh by means of a canal were developed earlier than the other projects already discussed. Indeed the Morris and Delaware canals were built largely as supplements to the Lehigh improvements.

Numerous unsuccessful ventures dating back as far as 1793 prefaced the successful completion of a waterway down the Lehigh in 1820. The coal was floated down in arks by means of artificial freshets. The tonnage grew rapidly, but was interfered with by the expense of constructing new arks for each trip, as they could not be returned up the river, but were broken up on arrival at Philadelphia. Since 1825 also an uninterrupted slackwater navigation had tapped the Schuylkill region. For these reasons an improvement of the waterway to a slackwater navigation up to Mauch Chunk was determined upon, especially as the state had committed itself to the improvement of the Delaware. The canal was able to accommodate boats of 120 tons by 1829. Upon the completion of the Delaware division the use of arks was gradually abandoned and permanent boats substituted. In the years following 1835 other slackwater improvements were introduced above Mauch Chunk and a railroad was substituted for the highest portion of the route.

The extensions were hardly completed when a disastrous flood almost wrecked the company in 1840. A few years put it on its feet, however, and the period 1840-1867 proved here, as on the Delaware & Hudson, one of exceptional prosperity, even the financial stringency of 1857, though it caused grumbling, did not cut down the dividend-paying ability of the company.

The coal tonnage, which had risen from 365 tons in 1820

to 225,585 tons in 1840, steadily grew to 1,276,367 tons in 1855. This was the period of the company's history during which its canal interests were most prominent in the minds of the managers. It was even planned to give up the mining of coal by leasing those properties and making the company a navigation company in a more confined sense. A change in this policy came with the year 1856, when the Lehigh Valley Railroad paralleled the navigation, necessitating reduction in toll rates and involving a diminution in tonnage. As a result the managers report in 1859: "The company must look for their remuneration to the augmented production of the mines . . . from which to derive a revenue." The importance of railroad connections was also increased.

During the Civil War the necessity for turning to lines of activity other than the exploitation of the canal was not emphasized to the extent it would have been but for the great increase in demand for coal which, notwithstanding the railroad competition, gave the canal more traffic than it was prepared to handle. Consequently the war years show profits unapproached before that time, though freshets, strikes and rate wars, and in 1862 a disastrous flood, cut down the profits that might have been reaped.

The Lehigh Company was not ignorant of the fact that the railroad development in progress threatened its prosperity, and even in these years of exceptional dividends took steps to counteract the coming disadvantages under which it would have to work. Extensive coal lands were purchased, the smaller tributary railroads absorbed and an extension of the Lehigh & Susquehanna Railway—till now a feeder to the canal only—was made from Mauch Chunk to Easton to compete with the Lehigh Valley Railroad. The company entered into the strife for tonnage and markets that absorbed the interest of the coal transporting routes in 1860-70. As a part of this policy the Delaware Division canal was acquired in 1866. In making these extensions the corporation outran its credit, and in 1870 found itself facing the possibility of a combination of the railroads across New Jersey, which would leave it without a rail outlet to New York. Both financial and strategic reasons counseled that an alliance be made with the Central Railroad of New Jersey, the only independent outlet remaining. For these reasons the railroad properties were leased to the Central Railroad of New Jersey in March, 1871, for a rental of one-third of the gross receipts on the line. For the time the Lehigh Company again became "a coal and navigation company . . . as during the period of (their) greatest prosperity." It had thus gotten rid of part of its financial responsibility before the panic of 1873. When that came the company was further embarrassed and was forced to sell its Wyoming coal holdings to a company allied with the Central Railroad, which latter corporation also leased all other properties of the Lehigh Company, including its two canals, in December, 1873. This agreement removed the Lehigh Company from active business operations until 1877, when the Central Railroad went into the hands of a receiver, and the leased properties, with the exception of the railroad, were returned to the owners. The return was by no means a misfortune, for the lessees had expended over \$1,100,000 in improvements upon the property which now returned to the owners without cost to them.

The relative importance of the company's properties had now changed radically. The majority of the capital was in the railroad—the rent from which formed the chief item of income. Next in value were the mines, and last, the canal. The canal tonnage since this period has gradually fallen with the increase of railroad connections to New York, the lowering of rates and the unfavorable terms granted on certain routes—notably the Delaware & Raritan Canal—making through trade in competition with the railroads unprofitable.

The success of operations is shown by the course of profits. From the time when the company again assumed control in

1877 up to 1884 the yield varied, showing a gradual increase up to \$276,106.20 in the latter year. After that profits gradually decreased to 1893, when they reached \$16,986.77. Since then there have been small profits and small losses on operation. A disastrous flood in 1902 necessitated increased repairs, and by cutting off tonnage helped to bring deficits.

At present the canal is operated with a tonnage of 240,151 tons (1906).

THE SCHUYLKILL CANAL.

The Schuylkill Canal is an intermediate term between the distinctively coal-carrying routes and the canals to tap the trade of the West. Originally planned with the latter object in view, its traffic was almost from the first chiefly coal. The construction for boats of 25 tons, with a depth of 3 ft., took place in the years 1818-25. In 1832, to accommodate the growing coal trade, it was enlarged to 80 tons capacity, and in 1845-47 to 170 tons. Even in the latter year, however, the coal traffic was only 6,500 tons. Beginning with 1832 the canal had a practical monopoly on the coal trade from the district it served, and for the next few years showed handsome profits. The stock rose to three and one-half times its par value, a figure till then unprecedented in the history of American joint-stock companies. The end of the prosperity of the route was foreshadowed in 1842, when the Philadelphia & Reading Railway was completed from the Falls of the Schuylkill to Port Richmond. This, with the other connections, gave a through rail route to the coal mines. The enlargement above mentioned and serious floods brought financial embarrassment, necessitating a reorganization of the company in 1852. In 1861 the Reading Railroad began to work for the monopoly of the trade by buying up the branch coal roads. The canal company adopted similar tactics and secured favorable tonnage contracts for 10 years, and satisfactory dividends were again resumed in 1866-67. The independent existence of the canal company was brought to an end in 1870 by the continuance of the Reading's plan to capture the avenues of coal supply from the Schuylkill region to Philadelphia. The canal and its properties in this year were leased to the Reading for 999 years, at a yearly rental of \$655,000. Since that time no important expenditures have been made to improve the canal, and through traffic has practically ceased.

HISTORICAL REVIEW SUMMARIZED.

In all of the waterways, the history of which has been reviewed, the main trade has been coal. The general trade has been negligible from the standpoint of profits, with the exception, perhaps, of the trade in iron ore on the Lehigh and Morris canals.

The canals fall into two classes—the Morris and the Delaware & Hudson; and the Lehigh, the Schuylkill, and the Delaware division. The first group involved carrying all through freight over heights of land intervening between the ends of the waterways. The latter group takes the heavy freight offered downward only. These groupings also correspond to the availability of the canals as trade routes, in the past and in the future. From this point of view the situation of the Morris canal is the least favorable. The physical difficulties to be overcome place it at a permanent disadvantage in comparison with the other routes, notwithstanding the location on the line from the coal fields to New York. In the present state of mechanical development the extended use of the inclined plane, even if the water supply could be increased sufficiently to support an enlarged canal, seems to be out of the question.

The Delaware & Hudson, except that inclined planes are not necessary, labors under similar disadvantages, but its ability to handle a large traffic is proved by its history. Its operation has been found unprofitable under present conditions, however, and the railroad interests in control do not look upon its rehabilitation as a practical matter. This is

also the case with the Schuylkill route, though in this case there is no summit level to be overcome.

The Lehigh and Delaware Division canals, now under one ownership, are in a different class. The physical conditions are more favorable and it is also to be noted that unlike the other two they are held by a company in which the development of the canals would not merely mean a supplemental outlet to a market already reached by its railroad holdings, but an independent access to markets now reached through agencies furnished by other transportation companies. These canals also have proved in the past their ability to handle traffic.

THE PRESENT PROBLEM OF COAL CANAL TRANSPORTATION.

The problem of successful maintenance of a coal-carrying canal is the same as for other transportation routes—the securing of tonnage. This is difficult at present because of the high local rates charged on the railroads which might prove feeders to the waterways. As a result the canals find it difficult to make a competitive rate such that they can compete with rail carriage on the through trade. The high local rates on coal shipped to the canals form so large a part of the cost of carriage to market that the canals must work at a peculiar disadvantage, unless they can supply the tonnage directly from their own coal mines or over railroads under their control. When the competing railroad companies are also coal mine owners, it is evidently against their interests to establish local rates which would divert traffic from their own to the rival transportation interests of the canals.

Another disadvantage of canals is the necessity of transhipment, especially when the cargoes on the canals are of small size. Where the coal must be loaded from a railroad to a canal boat, and later from a canal boat again to a railroad car, the incident expense greatly cuts into the ability of the canal to compete. Where the second transhipment can take place into large barges, the disadvantage is not so great, especially as the canal boat will have the ability to come directly along side, and wharfage charges can be avoided.

The inability to market products during the winter is a permanent limitation on the use of canals. Where the business must for months be transferred to the railroads there can naturally not be the continuity of business relations that is so much to be desired.

The technical problem of reducing the fixed charges of canal maintenance and the delays of lockage is also important in determining whether the canals can again be made available. The fixed charges of attendance of lockmen and the repairs of locks form the largest single item of expense on an average canal of 100 tons to 150 tons capacity. This renders the decrease of the number of locks an important factor in cutting down cost of operation. Modern engineering is making possible the use of locks of much greater height than those now in place on canals of medium size, and if such could be introduced with profit, adopting a 16 or 20-ft. lift where now 8 or 10-ft. locks are in use, an important saving could be made.

Locks of higher lift would also mean a great economy in time, for it takes only a small increase of time to fill or empty a lock of twice the usual present height. The great waste of time in lockage at present is consumed in getting the boat into the lock, not in raising or lowering the boat. The loss occasioned in checking a boat which is going into the lock too rapidly, or in starting one lacking momentum, and pulling it into the lock by hand or by winches consumes many times the time necessary to do the actual work of lockage. Where short lift locks are used the time spent in lockage is often as great as the entire time spent in actually traversing the prism. Higher locks would therefore mean a decrease in the personnel and equipment necessary to operate the canal as well as increased earnings on the capital invested in boats, due to increased ability of each boat to take produce to market.

The most decided advantage of a canal is in the low cost

of moving freight. Where speed is not an essential, as in the heavy and rough products, this may prove quite sufficient of itself to overcome disadvantages which would otherwise make operation unprofitable. The actual cost of moving freight—exclusive of lockage—on a 100-ton barge canal is somewhat less than one-half cent per ton per mile. If the barge is increased in size, the cost per ton-mile is more than proportionately less.

Where the fixed charges of a canal are low, this advantage in towing cost becomes a very important feature. A canal whose fixed charges and towing expenses with barges of 100-ton capacity, on a freight total of 250,000 tons, give a ton-mile cost of 1½ cents, would give a ton-mile cost of 1 cent per ton-mile on 500,000 tons and three-quarters of a cent per ton-mile on 1,000,000 tons. Increase in the size of the barges, decrease in the number of locks, or in the cost of towage, would, of course, further decrease ton-mile cost. In the latter item experience with electric traction in Europe shows that there important savings can be made over animal power. Towing from the bank of canals of the character under discussion has proven less wasteful of power than towing by tugs. Further, the distinct advantage is gained that it is accompanied by less washing of the banks. These reasons also set the profitable limit of speed even when mechanical traction is introduced at four miles an hour.

CAN COAL BE PROFITABLY CARRIED BY THE CANALS UNDER PRESENT ECONOMIC CONDITIONS?

The Morris Canal seems to be handicapped to such a degree that its abandonment may be accepted as final. Under present conditions the operation of the Delaware-Hudson route, once an important avenue of trade, has been found unprofitable, as already indicated, and there is no prospect of its further use in the near future. The same is true of the Schuylkill Canal.

Of the distinctively coal canals discussed, the only one in operation throughout its whole length is that furnishing an outlet by the Lehigh-Delaware route. This canal still carries a coal traffic of over 200,000 tons. During the past summer experiments have been introduced on the upper section with the object of finding whether mechanical traction can be introduced at a profit. Two experimental sections of two miles each have been installed. One section is operated by an electric device of the American Adhesion Traction Company; the other by a modification of the Lehigh Company's electric mine locomotive. All the traffic on both of these sections is handled exclusively by these machines, which run along the line of the old towpaths. They handle the traffic fairly well, and the expense of operation is less than that of animal power. Whether the fixed charges on the investment will overbalance this advantage cannot be stated as yet because of the short time in which the experiment has been in operation. Whether the canal can again prove itself able to furnish a profitable outlet for the coal trade depends upon the success of experiments of this nature and modifications to cut down the fixed charges, such as are mentioned above.

THE RELATION OF THE CANAL TO THE COASTWISE INLAND WATERWAYS.

If the canal can again prove itself able to deliver coal at the Bristol wharves on terms equal to the rates offered by the railroads, it would seem to have an assured business, even under present conditions, for the following reasons:

(1) To the Philadelphia market—the one to which the canal first sent its traffic—the canal has immediate access. The size of the city makes the market to be supplied one capable of large development.

(2) If the coal can be brought economically to Philadelphia, even under present conditions an important trade southbound can be developed. This would necessitate transshipment to larger coal barges, but that charge could be borne without destroying profits. That this is the case is proven by the

fact that the Reading Railroad finds it profitable to transship coal at Port Richmond from its cars to coal barges which it sends through the Chesapeake & Delaware Canal to the Baltimore, Washington and Norfolk markets. A profitable business has thus been built up in spite of the canal tolls involved on the Chesapeake & Delaware Canal. If the Lehigh Canal could profitably bring coal to Bristol, this trade would be open to it also.

The possibilities of developing markets other than Philadelphia would be greatly increased should the present movement to improve the coastwise waterways be attended with success. The trade to the south would be on a better footing because of the increased capacity of the boats into which the transshipment could be made, and because of the abolition of canal tolls.

More important even than this would be the outlet again opened to the canal, through the Delaware & Raritan, to the New York market. This would be a revival of a trade which for years formed an important factor in the total business of the Lehigh and Delaware canals. In 1867, 472,751 tons of coal from the Lehigh region passed into the navigable feeder of the Delaware & Raritan. By the same route were sent, even as late as 1884, 238,756 tons. This trade represented in each of these years nearly twice the amount that reached Bristol for the Philadelphia trade.

At present the Pennsylvania Railroad interests controlling the Delaware & Raritan route maintain the charges at such a figure that no competition can be given to the railroads by the canal company on through coal trade to New York. Were the tolls abolished and the channel widened this market, like that to the south, would be open to exploitation by those delivering coal by water.

The answer to the question of the future availability of the coal canals is therefore a double one. In the case of the Morris Canal its future availability seems highly improbable. In the case of two, and perhaps the four others, the problem is a technical one—whether the improvements of modern engineering can make their operation so economical as to make their use as a supplement to the railroads in carrying low-class freight a profitable one. Physical ability to handle traffic is proved by their history. Availability of tonnage, through the granting of competitive rates on the feeding lines, and economy of operation, are problems to be determined by the community of railroad and canal interests and by improvements in engineering. A revival in the near future seems possible on but two of the waterways—the ones carrying coal on the Lehigh-Delaware route.

FOREIGN RAILROAD NOTES.

For the first half of this year the gross earnings of the Swiss State Railroads were \$134,000 more than last year; their expenses \$780,000 more.

The Government of Chile has just let the contract to a French firm of Creusot for \$339,500 United States gold, to build three steel railroad bridges. One is over the Maule river, in the province of Constitución, and the others are in the province of Cautín, one being over the Chol-Chol river and the other over the river Ranquillo.

The contract has been signed for the extension of the Bagdad Railroad, a German project, from its present terminus for 520 miles east by south through the knot of mountains opposite the northeast corner of the Mediterranean, to the Euphrates, whence to the terminus at Basra, on the Persian Gulf, the distance is some 700 miles more, over a plain country. From the section now contracted for a branch is to be built southward to the Aleppo, to connect with the pilgrims railroad to Mecca.

OLIVER 20-YARD AIR DUMP CAR.

The accompanying illustrations show the new Oliver 20-yd. air dump car, made by the William J. Oliver Manufacturing Co., Knoxville, Tenn. This car is strongly built to stand severe service in the handling of earth or rock ballast. The draft sills are built up of two 15-in. steel channel beams, 33 lbs. to the foot, with separators, cover plates, etc. The bottom of the car is built of 3-in. oak timber, reinforced by a 10-in. center channel, 25 lbs. to the

Attention is called to the toggle or door-raising lever arrangement. As the car is dumped, the lower edge of the door is thrown upward and away from the contents of the car, thereby minimizing the liability of any material striking against and wedging or springing the door. The door-raising lever also locks the doors rigidly when the car body is in the horizontal position. This is one of the many patented features of the Oliver car, and is on all Oliver equipment. This car has a long truck-base which distributes the weight over a large area of false work, and, in dumping, all material goes



Oliver 20-Yard Air Dump Car.



Position When Dumping.

foot, which runs the full length of the body; also by two intermediate sills made up of 8-in. channel beams, 16 $\frac{1}{4}$ lbs. per foot, and by two outer edge braces of 6-in. x 4-in. x $\frac{3}{4}$ -in. angles, all of which run the full length of the car bottom. The body is trussed by two 1 $\frac{1}{2}$ -in. rods having turn buckles. The center sill is pivoted to nine hinges supported on the draft sills. The doors are built of $\frac{1}{8}$ -in. steel plate, reinforced longitudinally at the top and bottom by 6-in. x 4-in. x $\frac{3}{4}$ -in. angles which run the entire length of the doors and vertically by 14 3-in. x 2 $\frac{1}{2}$ -in. x $\frac{1}{8}$ -in. angles, which serve to stiffen the doors.

clear of the trucks and oil boxes. The trucks are all steel construction, M. C. B. standard, 60,000 lbs. capacity. Beneath the car are two pipe lines, the air-brake and the air-dump line. At each end of the car from the air-dump line there are two branch pipe lines, each of which is connected to one of the air-dump cylinders. When it is desired to dump the car, air is turned into the air-dump cylinder through a 3-way cock which causes a downward movement of the dumping piston, to the end of the rod of which a chain is attached running to the sheave on the longitudinal shaft. The rotation of the longitudinal shaft, and also the sheaves which are keyed to it, winds in the chains which govern the car body. To return the car body to the horizontal position, the air cylinders and chains on the opposite side of the car are brought into service. When the car body is in the normal, horizontal position, the pistons of both cylinders are at the middle position in the cylinders. When dumping, the pistons of opposite cylinders travel in opposite directions to the extreme positions in their respective cylinders.

This car is equipped with the Oliver patented steel non-clogging coupler. This coupler has the standard M. C. B. contour, with solid top and open bottom. The important feature of this design is that earth, even if it should get inside of the coupler casting, does not lodge there and interfere with the operation. The car is equipped with either New York or Westinghouse air brakes with all angle cocks of the piping placed so as to insure protection against the falling earth, rock, etc. Auxiliary hand brakes are also supplied.

TEXAS RAILROADS' REASONS FOR RAISING RATES.

The answers filed by several of the Texas railroads, in the proceeding begun by the Railroad Commission of Texas before the Interstate Commerce Commission to prevent the roads from putting into effect higher interstate rates to Texas points, set forth many interesting facts regarding the railroad situation in Texas. All the roads deny the charge that they are parties to a conspiracy to advance rates in violation of the Sherman anti-trust law. They also take issue with the contention of the state commission that there is every reasonable expectation that the net earnings of Texas railroads will continue to increase and that normal conditions will be restored without an advance in rates. They show that during the 11 months ending May 31, 1907, 23 of the principal railroads of Texas had a net income of \$6,509,342, while the same roads during the 11 months ending May 31, 1908, showed a net deficit of \$8,332,937, making a difference against the 11 months of the last fiscal year of approximately \$15,000,000, and they say that for the fiscal year ended June 30, 1908, the roads of the entire state will be found to show a deficit of more than \$9,000,000. They further allege that during the period since the creation of the Railroad Commission of Texas the railroads of the state as a whole have accumulated a total deficit of approximately \$25,000,000.

The Gulf, Colorado & Santa Fe denies that its true value is only \$16,969 per mile, or that it has been allowed to earn, after paying taxes and operating expenses for eight years, 4 per cent. on \$37,125 per mile of road. It states that its mileage of 1,150 miles, including 100 miles in Oklahoma, has a present value of \$44,762,062 and that the State Tax Board of Texas has recently valued the properties of the Gulf, Colorado & Santa Fe and its leased lines, the Cane Belt, the Gulf, Beaumont & Kansas City and the Great Northern, at more than \$35,000 per mile. The Gulf, Colorado & Santa Fe further states that since 1891, while expenses of every character have increased out of all proportion to increases in revenues, the Texas Commission has pursued a policy of steadily decreasing intra-state rates and has undertaken to justify such continuous decreases upon an incorrect valuation of railroad properties made by the Commission. The company is unable to understand why the Railroad Commission in its calculation of earnings in its petition adopts the basis of 4 per cent. per annum; if the Commission intended to imply that 4 per cent. was a fair interest charge such contention is very unjust because the laws of the state expressly authorize the issuance of railroad bonds bearing 6 per cent. interest. Several millions of such bonds were issued, with the approval of the Commission. The market rates of interest when the older lines were built having been higher than now, and the state having thus invited the world to invest in its railroads on a 6 per cent. basis, it is declared that "it is now nothing less than a public repudiation of an honest obligation to claim that 4 per cent. is sufficient."

The Galveston, Harrisburg & San Antonio denies that its bonded debt exceeds the fair value of its property, or that its true value is only \$17,289 per mile, as alleged by the Commission. It denies that it has been allowed to earn 4 per cent. on a valuation of \$36,725 per mile. It says that it has a mileage of 1,336 miles, that its actual present value is not less than \$60,000,000, and that the State Tax Board of Texas has valued its properties at \$55,000,000. Its total bonded debt is \$30,912,000, and its total stock \$27,084,000, and its actual value is asserted to be far in excess of its total capitalization. Notwithstanding it has been prudently and economically managed, it has not at any time since the organization of the Railroad Commission of Texas paid any dividend upon its stock or any interest on \$6,354,000 of its second mortgage bonds; that it has accumulated a floating debt of \$10,052,000, which was not incurred for betterments, and for the year ended June 30, 1908, after payment of taxes and fixed charges, it was operated

at a net loss of \$698,569. It contends that the increase in revenue which will accrue to the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, with which it forms a through route from the eastern to the western boundary of Texas, will not as a result of the proposed advance in rates exceed \$150,000 for both lines. It states that its taxes have increased from \$130,774 in 1904 to more than \$425,000 for the year ended June 30, 1908, and that its expenses of operation for the first 10 months of the fiscal year 1908, as compared with the same period of 1903, increased \$752,288, as follows: Expenses of operation, \$214,137; material, \$109,064; fuel, \$429,087. It is alleged that the exactions of the state legislature and the State Commission, such as the requirement for the equipment of all locomotives with electric headlights, for full "train crews," for the limitation of the hours of labor of telegraph operators and trainmen, for passenger trains to wait no longer than 30 minutes for connections, caused an increase in expenses in the fiscal year ended June 30, 1908, of no less than \$100,000. The order of the State Commission requiring the compilation of statistics for the information of the Commission has increased the expense of the road's accounting department \$7,500 a year and its requirement for additional statistics caused an expense of \$7,500 for the five years ended June 30, 1908. By reason of the increased expense of operation and the decrease in its earnings the road says that it "has been compelled to practice the most rigid economy wherever possible—has cut its forces to the lowest limit and has made no improvements where its duties to the public did not compel." The defendant says that such rigid economy cannot be long continued without serious impairment of its property and service.

The Houston & Texas Central denies that its bonded debt exceeds the fair value of its property, that its stock represents no value and that its true value is \$19,879 per mile. It further denies that it has been permitted to earn an equivalent of 4 per cent. on a valuation of \$55,725 per mile. It asserts that the valuation upon its property made by the Texas Commission is grossly incorrect, this having been made about the year 1894 when labor and all material used in the construction of a railroad was lower than now. Its mileage is 789 miles and it is stated that the actual present value of the property is not less than \$40,000,000, that the state of Texas for purposes of taxation has fixed the valuation of the property at \$32,188,220, that the railway cost its builders and owners more than \$40,000,000, that its capital stock is \$10,000,000 and its bonded debt is \$12,970,000, and that since the organization of the Railroad Commission of Texas it has paid but one dividend upon its stock, to wit, a dividend in 1903 of \$600,000. It states that for the year ending June 30, 1908, its surplus, after deducting interest and taxes, no allowance being made for betterments or improvements of any character, was \$347,798, that the proposed advance in rates, as applied to the traffic movement of the current year, will not afford an increase of more than \$52,775 in its revenues, that its taxes have been increased from \$109,246 in 1902 to \$230,402 in 1908 and that the increase in wages, in the price of materials and in the cost of operation, by reason of legislation by Congress and by the Texas legislature and by reason of orders of the Railroad Commission of Texas, have rendered it impossible, despite prudent and economical management, to conduct the business of the road without such rigid economy as cannot long continue without impairment of property and service.

The Texas & New Orleans denies that its bonded debt exceeds the fair value of its property, or that the true value of the property is \$19,780 per mile or that it has been permitted for the past eight years to earn 4 per cent. on a valuation of \$35,650 per mile. It says that its mileage is 445 miles, that its present value is not less than \$22,000,000, that the valuation placed upon it by the State of Texas for the purpose of taxation is \$20,647,673. Its funded debt, including

equipment obligations, is \$10,105,350, its total stock issue is \$5,000,000, and while it has been economically operated it has never paid a dividend upon its stock nor been permitted to earn such dividend. For the year ended June 30, 1908, after payment of taxes and interest, it earned a surplus of only \$138,004. Its taxes have increased from \$65,504 in 1903 to \$152,196 in 1908, and the increase in its operating expenses for the first ten months of the fiscal year 1908, as compared with the same period of 1903, were as follows: Fuel, \$142,843; operating expenses, \$149,083; material, \$109,064; total, \$400,991. It alleges that the increased expenses by reason of state legislation and orders of the State Commission have been not less than \$50,000 per annum and that it has been forced to operate with a rigid economy which if long continued will impair the value of its property and the efficiency of its service.

The Houston East & West Texas denies that its bonded debt exceeds the value of its property, that its true value is \$10,709 per mile or that it has been allowed to earn 4 per cent. on a valuation of \$34,575 per mile. It says that its mileage is 191 miles, that its actual value is not less than \$6,500,000, that the state of Texas for the purpose of taxation has valued it at \$6,563,562, that its bonded debt is \$3,000,000 and its stock \$1,900,000, and that while it has been economically operated it has never been permitted to earn a sufficient amount to pay any return upon its stock and its surplus for the fiscal year ended June 30, 1908, after the payment of interest and taxes, no allowance being made for betterments, was only \$81,400. It states that the rates complained of, as applied to the business of the current year, will afford to the Houston East & West Texas and its allied line, the Houston & Shreveport, which operates 39 miles in Louisiana, an increase in revenue of only \$13,862.

DISCUSSION OF A B C TRANSPORTATION RULES.

Railroad operating officers have been considerably interested in the A B C transportation rules devised by A. Beamer, Superintendent of the Northern Pacific, at Spokane, Wash. These rules and the results of operation under them have been described from time to time in *The Railway Age* (February 22, 1907, p. 237; April 12, 1907, p. 595; May 3, 1907, p. 698; May 17, 1907, p. 765; March 6, 1908, p. 303, and May 22, 1908, p. 741.) Mr. Beamer has received inquiries from a large number of railroads regarding the rules and the results secured under them, and several roads have sent representatives to Spokane to study the methods in actual operation on his division of the Northern Pacific. Among such roads are the Harriman lines, the Erie, the Lake Shore & Michigan Southern, the Michigan Central, the Canadian Pacific and the Atchison, Topeka & Santa Fe.

Mr. Beamer has had numerous requests for interpretation of the rules. One of these inquiries, which was from H. H. Temple, Superintendent of the New Castle division of the Baltimore & Ohio, and Mr. Beamer's reply, are as follows:

Question—"In the last part of Rule 1 it states, 'Block signals apply only to trains running in established direction.' Would be very glad if you would let me have your interpretation of this rule; and is it your decision that if a train on double track railroad was running east on the westbound track then the block signals would not govern? This train, while running on the westbound track, would still be running in its established direction and I find in this territory considerable argument on this matter."

Answer—"The signals in use on the Northern Pacific are of the three-position double-arm type. The clause referred to has reference to these signals and is understood to mean that the arm on the right side of the mast as viewed from an approaching train is the signal that governs, regardless of whether or not a train being operated on double track is in its proper position or being moved temporarily on the opposing track."

Answering an objection from another source to the effect that the A B C rules might be all right in congested business, but that under ordinary conditions their operation would prove expensive, Mr. Beamer has written:

"The facts are just the reverse. We can take any railroad, operate it under the standard rules, and apply the A B C rules without making a particle of change so far as physical conditions or number of employees in either train, engine, telegraph or despatching service is concerned, showing the same ratio of increased efficiency both as regards time in getting over the road and safety of operation. I presume that the opinion referred to arose out of the mistaken idea that we must have operators at all stations, and that during a period like the present, when retrenchment is the order of the day, a road under standard operation would close numerous telegraph offices, converting such offices into blind sidings, while it would not be possible to do this under A B C rules. But it is possible, just the same. Under standard rules, when necessity requires action of that kind, companies exercising it expect that there is going to be more or less inconvenience from the loss in train operation, but they figure that this loss will be much smaller in a money sense than would warrant the employment of the full telegraph force; hence the reduction. The same rule would apply to the A B C system. We cannot get the maximum efficiency afforded by the system without having offices at every station, but we can get the same ratio of efficiency under the changed conditions. It is only possible, it is assumed, to operate the A B C system with all stations open, but that is a mistake. Under standard operation with a number of stations closed, the practice is to give opposing trains meeting orders at these various points and such meeting orders are frequently put out a long distance before the meeting point is reached, and consequently considerable time, often many hours, must elapse before the order is accomplished, during which time the two crews concerned are expected to bear the orders in mind and not overlook them; if they do there is trouble. Under the A B C operation the orders involving such meeting points are not put out a long time in advance. Each of the trains concerned would get a block card at the last telegraph office passed by them before reaching the blind siding where it is designed to meet, and the crews consequently have to bear the instructions in mind but a very short time as compared with the other system.

"The card that each of them would get when passing the last telegraph station would authorize them to meet the opposing train at the blind siding involved. That process is exactly as safe, and in fact is identically the same, as the instructions of the system under which they are operated by standard rules. I am not talking theoretically, but from actual practice—simply relating what we are doing now in the territory under operation by the A B C rules. Instead of the operation being expensive, as some people imagine, it is possible in many instances to make it very inexpensive. For example, upon one of our branch lines we operate four passenger trains daily and a number of freight trains. Two of these passenger trains are night trains and many of the freight trains are night trains. It is, therefore, necessary to have more or less night operators scattered along in order to avoid serious delay. The branch is one where no great amount of speed is required. Given a telephone line with telephone booths erected at all of the side tracks, I will undertake to operate a branch line of that kind without a night operator from one end to the other, or a day or night operator either, so far as that is concerned, if the local business of the company does not warrant the employment of a man in that capacity to look after freight and passenger business.

"All that is required under such conditions is to have the train stop at the various booths, call up the despatcher and obtain the block card from him for the block ahead, which, under the rules, cannot possibly be occupied without his au-

thority. The responsibility for an operation of that sort would, of course, rest entirely on the despatcher just the same as it does under standard operation, and would be without the double check that the A B C rules contemplate where the consent of the operator at each end of the block is required for each train moved."

It was suggested by one of the railroad officers who inspected the A B C system in operation on the Northern Pacific that it would be impossible for his line to get its fast mail train over the road as fast as the extra used in the inspection trip was pulled—45 miles an hour—even if the mail train were given absolute rights, for the reason that the trains along the line with which he is connected are operated by time card rules and the card shows a stated time at each station, which cannot be passed in advance of that time no matter what the track conditions may be. The suggested remedy in such a case is to abolish time cards and standard rules and apply the A B C system, for then track conditions would govern entirely; if an engineer is able to make a fast run over a good piece of track and pass a station in advance of the time at which he would be carded there under standard rules, there is nothing to prevent his doing this and the time so gained is either gained at the end of the run or used in slowing down over poor track without loss of schedule time in the end.

The following are extracts from a letter written by Mr. Beamer to a despatcher on a southern road, whose superintendent wishes to handle without train orders the trains in a despatching district where, when business is normal, there are 60 or 65 trains per day and where, when business is heavy, there are 70 or 75 trains per day, and where there is a telegraph office at all passing tracks:

"The principle upon which we work is the entire absence of a time card. All trains are run as specials and extras, having no train rights either by classification or direction. They move only on orders from the despatcher's office in the form of block cards from one telegraph to the next. The entire operation is in the hands of a despatcher, whose duty it is to see that the block cards are put out one block in advance of each train, and whose further duty it is to notify the respective trains when they are to meet the opposing trains, and to indicate which one of them shall take the side track. The system has been in operation on this division for something over eight months, and we have succeeded in getting our freight trains over the road 20 per cent. quicker than we ever did before and this, too, during a period when at times we have had more trains to handle than we did a year ago, the period with which we are making the comparison.

"It was first thought that the multiplicity of orders or cards would so hamper the system that it would not be possible to make a success of it. However, the formula used is so extremely brief and the work so quickly done that we have demonstrated practically the possibility of a despatcher successfully covering a larger territory than was possible under the standard rules.

"On nine miles of territory that we have under this operation we handle between 35 and 50 trains per day, and on several occasions we have handled trains for a number of hours at the rate of 78 trains per day and have not yet reached the limit of either the wire or the despatcher. There is a limit, of course, to both, but we have not found it.

"You will appreciate the facility with which telephone transmission can be adapted to this system to avoid, as it would, all danger from a possible misunderstanding over the wire, since but one form of order is possible, that to run from one telegraph office to the next. If an error was made the crew of the train concerned would immediately detect it. It is not possible to run a train past a telegraph office; consequently they could not pass a meeting point. A great element of safety involved in the operation is contained in that phase of it, because the crews themselves know whether their orders are correct or not, this, of course, barring errors that might be

made by all three men (the operator who asks the despatcher for the block, the despatcher who authorizes it, and the operator at the other end of the block who pledges it), making the same mistake at the same moment in giving the train a block that had previously been given to someone else—an extremely remote possibility."

HOW TO KEEP THE RECORDS OF A SMALL TELEGRAPH OFFICE.

The present rules in the tariff book, if intelligently carried out, cover all requirements fully, especially in the collection of deficits. We recently received for collection an error sheet amounting to 25 cents on a message sent 21 years ago. A system so far reaching could scarcely be considered inadequate.

On the Wabash the reports are sent to the Superintendent of Telegraph, where they are carefully audited and corrected, and sent to the several Western Union Superintendents, with consolidated statements on form 23, and a comparative statement with the same month of the previous year. Error sheets come to the Superintendent of Telegraph from the Western Union District Superintendents, and are copied in the error sheet book and then sent to the various offices with a receipt card and a sufficient number of postal cards, form 47, for adjustment. The receipts are carefully checked in and tracers kept going in such cases as are necessary. The time for the manager to begin to make up his report is when he handles the first message, and he should be required to keep a proper file of all commercial business separate from the railroad files, and each day by itself.

For the average office a simple file of three divisions will be sufficient for a month. The first division should be large enough to hold all the messages handled during the month.

The other two divisions will require only sufficient space for the messages held out to go in with the reports in one, and the error sheets and correspondence relating to them in the other. If nothing better is available, a table drawer for the messages and two large envelopes for the other divisions will answer.

Daily records of receipts and the number and kind of messages handled, both Sent and Received, should be tabulated so as to be ready for use in making up the reports. This record can be kept on the check ledger by writing suitable headings at the top, and will only require half of one page each month. Press or carbon copies of the monthly reports should be made and filed with the messages of the same month. If the daily register form 40 is used, that and the check ledger can be kept on top of the messages in the first division of the file. It will scarcely be necessary to provide a money drawer, as the manager can use one of his vest pockets for that purpose.

Instructions to managers should be as brief and simple as possible, but all managers should be constantly admonished to study the rules carefully and obey them implicitly, referring doubtful points to the Superintendent as they come up. Operators are frequently careless about complying with the rules to see that all messages are written on or attached to the sending blank, and they often omit the filing time on sent messages, and sometimes neglect to endorse the time on messages received, and time of calls on delayed messages. They should be specially cautioned on these points and also impressed with the necessity of taking receipts for messages delivered and of filing these receipts with the day's business.—*J. P. Church (Wabash) at Railway Telegraph Superintendents' Convention.*

Vice-Consul Harry Suslow, of Moscow, writes that the administration of the Russian Dniepropovskiy Metallurgic Co. recently signed a contract in St. Petersburg with the Japanese Government for 360,000 poods (5,806 tons) of 72-lb. rails. Delivery is to be made at Port Dalny for the southern parts of the Manchurian railroad.

General News Section.

At the Fourth street freight yard in St. Louis, the Wabash Railroad has a depressed track for loading and unloading automobiles and other heavy wheeled vehicles. That is to say, instead of providing a platform with a ramp to run vehicles up to or down from the level of an ordinary platform, the cars themselves are run down to such a level that their floors are even with the pavement.

On the Schuylkill division of the Pennsylvania, where the officers of the company have had some difficulty in keeping their roadway clear of rubbish, and where they have lately been prosecuting a mild campaign in the newspapers against abutting property owners who decorate the right-of-way with their old tomato cans, the head of the State Health Department, Dr. Samuel G. Dixon, has come to the aid of the railroad, taking a vigorous hand in the same direction; and it is given out that he is going to issue a circular to the local health departments calling attention to the need of prohibiting the littering of railroads' rights-of-way with rubbish.

The license of the St. Louis & San Francisco to do business in Oklahoma was revoked by Leo Meyer, Acting Secretary of State, on August 30. A state law of Oklahoma provides that the license of any corporation to do business in the state shall be revoked if, on the ground that it is a foreign corporation, it shall transfer a suit brought by a citizen of the state from a state to a federal court. Mrs. Gertrude Goods brought a suit against the Frisco for damages, in the district court of Comanche county, and the road transferred the suit to the Federal court. The road secured an injunction from the federal court to restrain the Secretary of State from revoking its license, but the order was not served until an hour and a half after Mr. Meyer had taken action.

The Chicago, Milwaukee & St. Paul is to run an exhibition car over its lines with a display of the products of the state of Washington contiguous to the Pacific Coast extension of its road, now under construction. The display will include fruits, grains, forest products and minerals; and persons interested in advertising Washington have been invited to furnish literature to be distributed along the way. At the principal stops, where convenient, stereopticon views of the country along the Pacific Coast extension and of the state of Washington generally, will be exhibited. Besides the car carrying the display there will be a special sleeper for the persons in charge of the exhibit, and it is estimated that about \$30,000 will be spent in thus advertising the state of Washington.

The Chicago & North-Western on September 6 will establish daily through sleeping car service between Chicago and Rapid City, S. D., via Elroy, Mankato and Huron. The train carrying the through sleeper will leave Chicago at 8:04 p. m. This will be the first through sleeping car service to Rapid City from Chicago. At the same time the North-Western will establish through sleeping car service between Omaha, Neb., and Huron, S. D., via Alton, Ia. This will be the first direct through sleeping car service between these points. The train hauling the sleeper will leave Omaha at 8:20 p. m. daily. The North-Western, which leaves Chicago at 9 a. m. daily for St. Paul and Minneapolis, will hereafter be run daily and will have through coaches from Chicago to Pierre, S. D., and except Sunday will have coaches from Pierre to Deadwood via Rapid City.

The officers of the Long Island Railroad, who have been put to their wits' end to prevent reckless driving of automobiles across the tracks of the road at grade crossings, have finally agreed with the officers of the Long Island Automobile Club, and with other citizens interested, to have hummocks about a foot high made in the road on each side of a number of grade crossings where abuse of the speed regulations has been most flagrant. This arrangement has been tried in Babylon, L. I., and is said to have proved satisfactory. President Peters, of the Long Island, is quoted as saying that the railroad company will pay half the expense of making the

hummocks. The Long Island road has 429 grade crossings. The watchmen who have been recently employed by the road to take the numbers of automobiles at crossings, have been the means of exposing a number of chauffeurs who were running their employers' cars without authority.

The Southern Pacific has brought a suit before Judge Wolverton in the federal court at Portland, Ore., in which it attacks the constitutionality of the law creating the Oregon Railroad Commission. The Commission last March issued an order requiring the Southern Pacific to so connect its tracks at Portland with the track of the United Railways as to give certain shippers more direct communication with the terminals in Portland. The Southern Pacific alleges that the Oregon law gives the Commission legislative, executive and judicial powers, in violation of the state constitution. It further contends that 90 per cent. of the business that it handles on the line which it is required to connect with the tracks of the United Railways, is interstate commerce and, therefore, not subject to regulation by the State Commission. It alleges that compliance with the order would necessitate construction of tracks on land owned by the Southern Pacific and would amount to the taking of private property for public use without due compensation.

The appeal of the State of Kentucky from the decision of the United States Circuit Court for the Eastern District of Kentucky, declaring unconstitutional the statute of that State empowering the State Railroad Commission to fix rates has been filed in the Supreme Court of the United States. The law in question is known as the McChord law, and it now comes before the Supreme Court for the second time. In a previous proceeding by the railroads it was declared unconstitutional by Judge Walter Evans, but when that suit came before the Supreme Court, that tribunal did not pass upon the validity of the law, but reversed Judge Evans on the ground that his decision was in the nature of legislation. The railroads refused to accept this ruling as final, but, again applying to the Federal courts for relief, asked for an injunction against the enforcement of the law and for a direct construction with reference to its constitutionality. Judge Cochran, before whom the case then came, declined to enter upon the merits of the controversy, but, as a compliment to Judge Evans, perfunctorily held it to be in contravention of the Fourteenth Amendment, at the same time suggesting the wisdom of obtaining the views of the Supreme Court as soon as possible. The railroad companies declare their intention not to enforce the commission's rates until relief is denied by the court having final jurisdiction, which is the Supreme Court.

Railroad Earnings in Texas.

The Railroad Commission of Texas has issued a preliminary statement of results of operation of Texas railroads during the fiscal year ended June 30, 1908. The statistics are as follows:

	1907.	1908.	Net.	Per ct.
Passenger train earnings	\$24,817,656	\$24,728,181	Dec.	\$89,475 0.36
Freight earnings	65,209,917	55,780,724	"	9,429,193 14.46
Other earnings	4,858,702	327,575	"	4,531,127 93.25
Gross earnings	94,886,276	80,836,481	"	14,049,795 14.81
Operating expenses	69,864,642	67,525,684	"	2,338,958 3.35
Income from operation	25,021,633	13,310,796	"	11,710,837 46.80

The Commission appends a statement going to show that the losses sustained by the railroads have been even larger than the statistics would indicate, the discrepancy being due to the change on June 30, 1907, in the system of accounts. The Commission has made an estimate of the amount excluded from the 1908 figures that was formerly credited to gross earnings. Its estimate is \$4,531,127, which, if subtracted from the decrease in gross earnings shown by the above statement, would leave a net decrease in gross of \$9,518,668 or 10.03 per cent. It is also estimated that there has been excluded from operating expenses \$5,564,207, which, if added to the net decrease in operating expenses shown by the foregoing statement, would make a net increase in operating expenses during the year of \$3,225,248 instead of a decrease of \$2,338,958.

or an increase of 4.61 per cent., instead of a decrease of 3.35 per cent. The difference between the amount estimated to have been excluded from gross earnings and the amount estimated to have been taken out of operating expenses is \$1,033,080, which should be added to the net decrease in income from operation shown by the above statement. This makes the net decrease in income from operation \$12,743,917, instead of \$11,710,837, or 50.93 per cent. instead of 46.80 per cent.

Cost of Williams Bridge Derailment.

The wreck of the Brewster express on the Harlem division of the New York Central & Hudson River Railroad, near Williams Bridge, N. Y., February 16, 1907, will cost \$1,214,000. Claims for damages were put in for 22 persons who were killed and 156 who were injured. Of the \$1,214,000, \$659,000 has gone or will go to the relatives of the dead, or to the maimed and injured. The remaining \$555,000 goes to the lawyers, to agents who settled claims out of court, to physicians, investigators and various experts, and for trial of suits.

Twenty of the 22 death claims have been settled out of court. In the only case which has been tried so far the jury gave damages of only \$6,500 and the plaintiff, the aged mother of the victim, who was her sole support, appealed on the ground that the damages were insufficient. Efforts are being made to settle the remaining case, and it is expected that this will be done by payment of \$30,000.

The largest amount paid for a single death was \$75,000; the smallest \$5,000. The average was \$13,324. Eighteen of the 22 victims were women, 11 of them unmarried, which reduced materially the damages the company had to pay. Among those injured the highest damages awarded has been \$32,500 to a young woman whose left leg was amputated. This verdict has been appealed by the company. Settlements for injuries have ranged from \$1,000 upward.—*Buffalo Commercial*.

Condition of the Cotton Crop.

The crop reporting board of the United States Department of Agriculture finds that the average condition of the cotton crop on August 25 was 76.1 per cent. of a normal, as compared with 83.0 on July 25, 1908; 72.7 on August 25, 1907; 77.3 on August 25, 1906; and 73.9 the average of the August 25 conditions for the past ten years. Comparisons by states follow:

States.	Per cent. of U. S. acreage in states.	Condition		10-year average		
		On August 25, 1908.	1907.	1906.	1908.	July 25, 1908.
United States..	100.0	76.1	72.7	77.3	83.0	81.4
Virginia	87	77	71	90	83	81
North Carolina ..	5	80	78	71	89	81
South Carolina ..	8	76	83	71	84	80
Georgia	15	77	81	72	85	81
Florida	1	80	80	70	85	84
Alabama	11	77	73	76	85	81
Mississippi	10	79	72	82	86	80
Louisiana	5	63	69	76	83	82
Texas	30	75	67	78	82	82
Arkansas	6	83	65	84	86	82
Tennessee	2	88	78	88	88	84
Missouri	90	75	94	88	84	81
Oklahoma	7	70	71	84	66	85
					77	70

Strike Situation in Big Four Shops.

The officers of the Cleveland, Cincinnati, Chicago & St. Louis say that they have practically won their fight with the striking employees in the shops at Mattoon, Indianapolis, and other points. The trouble was started by the introduction of the piece work system in the new shops of the company at Beech Grove, Ind., about the middle of last June. The employees at other shops on the line walked out as a protest against the piece work system at Beech Grove, although it was not introduced elsewhere. The company at once began hiring men to take the places of the strikers and it now has practically as many as it needs, almost none of which are from among those who struck. Threats have been made by leaders of the labor unions to bring about strikes in the shops of other roads in the New York Central system, and it has been reported that the men in some of the shops of the New York Central, the Michigan Central, and the Lake Shore & Michigan Southern

have voted in favor of a strike, but no other step in this direction has been taken. The Big Four at the last report had 27 locomotives in its Beech Grove shops, which have a capacity of 52 locomotives.

New York Central High Tension Transmission Wires.

The New York Public Service Commission, First District, has rendered a decision affirming the right of the New York Central & Hudson River to continue to use its overhead high tension system of electrical transmission. The complaint of John H. O'Brien, Commissioner of Water Supply, Gas and Electricity, who asked that the company be directed to place its wires underground, be dismissed. The decision of the Commission, however, which was written by Commissioner John E. Eustis, who conducted the hearings, directs that certain changes be made in the present construction of the overhead system so as to make it absolutely safe at street crossings and other dangerous points.

New York Railroad Club.

The first regular meeting of the 1908-1909 season of the New York Railroad Club will be held at the United Engineering Society's building, 29 West Thirty-ninth street, on Friday evening, September 18, 1908, at 8 o'clock. Nominations for officers for the next fiscal year will be reported, and Raffe Emerson, Assistant Engineer of Methods on the Atchison, Topeka & Santa Fe, will present a paper on "Better Service at Reduced Cost."

Favoritism?

It is a pleasure to see with one's own eye that the soulless corporations, or, at least some of them, have a little consideration for the weaker sex. I had occasion to board a street car in a busy little city in the Middle West, where every one is earnestly pursuing the almighty dollar and forgetting courtesy and chivalry in the meantime. Not so, however, with the manly directors of the only street car line. No indeed! Every other strap was fully half a foot longer than its neighbor, and there was a placard which read, in big, black letters: "The long straps are for the use of ladies."—*Lynchburg (Va.) News*.

Grizzly in a Railroad Yard.

A big grizzly bear got into the Northern Pacific Railroad yard at Billings, Mont., the other night. When the railroaders entered the enclosure for duty in the morning they left very suddenly when they found the bear. Work was suspended for three hours. The bear was roped and put in a cage in the park. The bear came down from the mountains during the night. When first seen he was throwing ties into the turntable. In the dim light of early morning he was taken for a drunken tramp and a switchman approached him to throw him out of the yards. He found out his mistake in time.—*New York Sun*.

Harvard Graduate School of Business Administration.

This newly established professional school at Harvard opens on October 1 next. It is open only to graduates from approved colleges and scientific schools. The design is to give to a partially trained young man a practical and specialized professional instruction, suitable to the particular business which he plans to enter, for a two years' course. The courses include accounting, commercial law, economic resources, industrial organization, banking and finance, transportation, insurance and public business. The transportation course is sub-divided. Railroad organization and finance are under Dr. Stuart Daggett. Railroad operation is in charge of W. D. Cunningham, statistician of the Boston & Albany Railroad. The theory and practice of rate making is in charge of Edgar J. Rich, General Solicitor of the Boston & Maine. Railroad accounting is also in charge of Dr. Daggett. Other lecturers well equipped in their several specialties will add great value to the courses.

For example, A. H. Joline, Chairman of the Board of the Missouri, Kansas & Texas Railway and Receiver of the New York City Metropolitan system, will give instruction in corporation finance, and surely he should be well qualified for this.

Causes and Sources of Claims.

The stream of loss and damage claims may be likened to a great river. The sources of the stream, the little springs, are the General Managers, the Traffic Managers, the classifications, the rates, the Contracting Agents, the people who ship, who haul the goods, who receive the goods, who load and handle cars, who forward the cars, who receive the cars and the goods. . . . The Traffic Manager is one spring. He it is, say, who classified and named a rate on "pianos, not boxed." Such shipments are set into cars, a scantling or two nailed across the cars, some bunches of excelsior stuffed in at spots to "prevent chafing," and the pianos, billed as "harnessed," are turned out at destination looking as if what they had been harnessed to was a lot of extra large double back acting mules. The claims which follow always correspond. But it is left to supposition that the rate, foolishly made, will be still more foolishly maintained, because somewhere one man is afraid to break away and all cannot be brought to agree to a change to what should be. All fear that a little traffic may be lost. And the fear induces in the traffic man all sorts of evasions, trickeries and schemes. Waiting for joint action, the traffic people go on accepting bank safes, heavy machinery, radiators, stoves, etc., all set up, and the freight offices receive them, and load them, and the Claim Agents kick while they pay for broken legs, scores and hundreds of them. Double rates for such things "set up" on the one hand, or instructions how to properly load such goods, would put a large plug into this fountain of claims.—*S. D. Webster, St. Louis.*

Traffic News.

The Union Pacific has announced that it will make a rate of one fare for the round trip, or 1 cent a mile, for the state fair at Lincoln, Neb. This is the lowest rate that has been made for such an occasion in the West since the state 2-cent fare laws were passed in 1907.

The western railroads have not reached any understanding as to what action they finally will take in reference to the bills of lading recommended for general adoption by the Interstate Commerce Commission. Some of the roads have signified to the commission that they will adopt the forms recommended. The Chicago, Rock Island & Pacific, not desiring to go to the expense of having a large quantity of bills of lading printed until the question shall be finally settled, is issuing a "dray ticket" which is merely a receipt for goods in the transportation of which the road assumes its full common law liability. Other roads on various grounds have opposed the forms recommended by the Commission.

The Mexican government has granted the application of the Mexican Southern for permission to abolish third class passenger service. It is stated that permission to abolish third class service has now been granted to all of the railroads in Mexico. The roads formerly ran first, second and third class coaches. Newspaper despatches state that as persons who formerly rode third class have now to ride second class, those who formerly rode second class have been practically forced into the first class coaches, and the passenger earnings of the roads have been materially increased by the change. The Mexican Railway, between Vera Cruz and the City of Mexico, is the only line that still runs third class cars.

D. O. Ives, formerly General Traffic Manager of the Wabash and now Chairman of the Official Classification Committee, was the guest of honor at a luncheon given at the Mercantile Club in St. Louis on August 29 by the following traffic officials of the Wabash: W. C. Maxwell, General Traffic Manager; C. H. Stinson, General Freight Agent; J. D. McNamara, General Passenger Agent; E. R. Newman, R. M. Collyer, J. D. Lund and W. F. Schmidt, Assistant General Freight Agents; H. V. P. Taylor and F. H. Tristram, Assistant General Pas-

senger Agents. A number of other persons in the traffic department of the Wabash were also present. Mr. Ives was presented in behalf of the officials and employees in the traffic department of the Wabash with a silver service.

An advance in the rates on apples from the Pacific Northwest to the East has been announced, effective on September 13. The rate from Portland, the Willamette Valley and other North Pacific coast points to St. Paul, Omaha, Colorado points and St. Louis in carloads will be advanced from 80 cents to \$1; from The Dalles, Hood river and surrounding fruit stations the rate to St. Paul, Minneapolis, Omaha and Colorado points will be raised from 75 cents to 90 cents, and to Chicago from 89½ cents to \$1. Similar advances will be made between other points. The minimum weight for mixed carload lots, when apples are included, is also to be raised from 20,000 to 24,000 lbs. The Northwestern Fruit Distributors' Association, Fargo, N. Dak., has called a meeting of fruit shippers, to be held in St. Paul, to protest against the advance.

The officers of the Commercial Club of Omaha and the Omaha Grain Exchange have issued a statement to the members of these organizations in which they say that "all the differences between the grain interests of Omaha and the Rock Island-Frisco system have been settled in a satisfactory manner" and that they have been instructed by their transportation committees "to advise you of this fact, so that if the routing of your business during the last two years has been influenced unfavorably to the Rock Island-Frisco System by reason of information given to you by these organizations, you may know that no reason for any discrimination exists at the present time, as the attitude of those roads toward the Omaha grain interests is now just and fair." The differences between the Omaha grain interests and the Rock Island-Frisco System were referred to in our issues of June 19, page 198, and June 26, page 401. Officers of the Rock Island-Frisco System say that negotiations have been pending for certain readjustments in rates through Omaha and that they have succeeded in convincing Omaha grain dealers that the Omaha market is being dealt with fairly.

The New York, New Haven & Hartford has decided to resume through freight traffic arrangements with the Central of New Jersey and other roads leading from New York westward, with which the New Haven ceased making through rates last March. Complaint was made to the Interstate Commerce Commission and a number of hearings were held but the commission has not as yet made any order, and the present action appears to have been taken after a conference with the commission. Authority has been granted to put the restored joint tariffs into effect September 1. The New Haven gave notice of its withdrawal from these through tariffs at a time when business was very heavy, and the reason given was that it would be to the New Haven's interest to have this freight sent by way of the Poughkeepsie bridge; but the New Jersey roads looked upon the Poughkeepsie bridge connection as an inconvenient and costly route and one not liked by shippers. With the Pennsylvania and the Lehigh Valley the New Haven continued its through-billing arrangements undisturbed. It was said that the New Haven's objection to the high price which it had to pay for the use of the other companies' cars was one reason for its action. The rate for cars has now been reduced from 50 cents a day to 25 cents.

Traffic Club of Chicago.

The board of directors of the Traffic Club of Chicago has decided that the club's first luncheon of the fall shall be held on Thursday, October 1, and that in the early part of the season luncheons shall be held once a month instead of weekly, as was done last year. The place for the luncheons has not been selected. On September 15 the club will have an outing at one of the country clubs near Chicago.

Southern Classification Committee.

A special meeting of the Southern Classification Committee has been called for September 11, at which final consideration will be given to the propositions to advance minimum carload weights on a number of commodities.

REPORT OF EARNINGS AND EXPENSES OF RAILROADS.

MONTH OF JUNE, 1908.

(See also issues of August 7, 14, 21 and 28.)

Name of road.	Mileage operated at end of period.	Operating revenues		From				Operating expenses				Operating income (or loss).			
		Passenger.	Freight.	From trans-	trans-	Total	Maintenance	Way and	of equipment.	Trans-	General	Traffic.	Operating expenses.	Taxes.	Total
Central Branch, Western	388	\$20,151	\$96,352	\$8,297	\$1,036	\$96,536	\$15,489	\$6,405	\$2,387	\$36,762	\$3,558	\$32,235	\$5,399	\$26,836	
Chicago Great, Western	818	1,48,071	392,796	48,177	3,566	593,212	95,091	101,757	33,179	253,306	29,604	80,275	17,000	63,275	
Cincinnati & Muskingum Valley	148	1,50,790	1,55,89	4,213	228	60,559	11,855	7,049	1,267	22,241	1,159	16,797	3,930	13,049	
Coal & Coke	191	3,56,171	9,573	1,198	5,919	46,987	9,552	13,639	667	14,091	2,482	40,431	6,556	4,000	
Evanville & Indianapolis	149	15,073	6,972	2,900	1,247	27,772	11,851	19,239	443	11,886	784	25,605	2,167	2,172	
Evanville & Terre Haute	164	88,976	33,862	9,075	1,453	134,227	11,851	19,239	3,901	39,696	5,343	41,552	9,271	6,700	
Fort Worth & Rio Grande	196	31,210	20,174	3,884	2,255	55,526	10,719	13,288	2,465	27,593	3,613	45,678	3,170	4,078	
International Ry. of Great Northern	1,159	38,089	12,826	4,039	4,039	55,548	11,451	10,492	15,654	28,969	17,732	37,753	24,165	15,588	
Kanawha & Michigan	29,261	15,585	6,050	5,016	5,016	51,402	13,528	8,623	2,817	21,134	2,012	48,114	3,288	16,212	
Lehigh & New England	177	149,998	23,976	8,183	5,562	177,439	17,438	17,438	2,504	45,233	2,683	46,400	6,363	59,037	
Louisiana & Arkansas	167	67,530	17,790	4,448	3,386	70,104	11,769	9,031	1,856	18,555	2,697	42,914	850	26,340	
Louisville, Henderson & St. Louis	226	68,815	12,668	2,254	1,294	75,966	16,171	15,876	1,552	27,136	2,928	63,663	3,941	32,591	
Mason City & Fort Dodge	200	38,936	31,153	5,138	2,255	51,138	29,487	29,487	2,197	30,407	3,134	32,792	2,632	16,160	
Mineral Range	102,780	39,555	8,068	2,555	1,075	54,558	21,623	19,802	1,780	38,309	3,199	101,713	52,845	46,845	
Minnesota & International	129	63,548	4,456	1,636	1,238	58,226	10,186	10,186	1,043	32,981	3,583	51,515	3,714	8,001	
Missouri Pacific	177	29,831	13,646	3,322	4,52	46,251	10,192	10,192	3,923	32,959	3,659	33,261	12,990	11,151	
Mobile & Ohio	3492	1,01,274	132,190	30,205	30,205	132,603	19,078	19,078	3,205	60,574	4,615	11,241	49,231	49,231	
Montana & Southern	157	51,850	92,355	101,049	9,664	72,621	7,721	7,721	68,938	24,025	37,945	24,190	209,302	40,469	
Norfolk & Southern	582	1,62,397	5,584	1,284	1,284	73,522	17,706	17,706	2,688	19,010	2,928	17,330	28,472	28,472	
Northern Kansas Ry. of Texas	5,649	2,62,397	1,30,091	9,113	263,214	201,732	38,402	39,066	6,818	73,806	11,912	170,004	31,169	36,068	
Pecos & Northern Texas	153	57,963	1,844	3,263	3,263	4,239,807	1,653,069	1,653,069	533,619	77,514	1,494,805	69,971	3,882,189	47,639	
Pittsburgh, Shawmut & Northern	244	47,466	7,238	1,238	1,238	60,166	8,838	8,838	10,057	607	18,407	1,682	72,109	32,745	
Richmond, Petersburg & Potomac	83	108,435	22,224	3,345	3,345	55,789	24,580	24,580	20,974	797	20,539	2,748	14,847	9,195	
St. Louis, Iron Mountain & Southern	2,599	1,22,550	321,784	116,283	27,28	1,742	11,605	17,059	24,479	2,101	19,692	69,367	642	68,172	
St. Louis, San Francisco & Texas	125	38,002	5,611	2,506	2,506	40,802	26,476	26,476	5,602	37,012	5,184	42,563	7,393	68,172	
Southern Kansas Ry. of Texas	125	16,783	22,224	4,262	4,262	42,657	3,046	3,046	1,636	21,126	2,018	21,126	1,276	22,402	
Spokane & Inland Empire	152	22,224	42,657	3,046	3,046	50,603	7,091	12,317	1,925	22,224	2,018	21,962	1,797	16,783	
Tonopah & Goldfield	106	14,172	20,201	2,862	2,862	50,732	6,221	6,221	11,632	9,431	9,431	21,321	1,500	19,821	
Ulster & Delaware	129	25,529	36,288	2,560	523	94,633	11,988	11,988	2,624	5,330	5,330	34,659	4,260	30,399	
Virginia & Southwestern	184	7,133	12,137	2,649	2,649	22,332	8,388	8,388	2,624	1,222	2,513	10,903	2,049	6,134	
Wabash Pittsburgh Terminal	63	62,101	8,153	3,404	3,404	74,466	7,118	6,945	8,764	1,558	2,052	8,981	2,018	6,037	
Western Ry. of Alabama	133	36,634	5,763	4,452	4,452	76,389	2,561	13,885	4,542	27,822	3,935	52,775	4,719	18,915	
Wisconsin, Minnesota & Pacific	271	31,726	17,646	5,017	5,017	54,331	18,537	18,537	9,271	20,321	6,565	5,655	2,173	3,482	
TWELVE MONTHS OF FISCAL YEAR, 1908.															
Central Branch, Western	388	\$1,075,200	\$81,151,251	\$97,465	\$10,882	\$1,498,798	\$2,513	\$1,578	\$1,876,652	\$33,426	\$450,952	\$44,390	\$529,508	\$416,552	
Chicago Great, Western	1818	1,88,748	1,88,748	52,823	52,823	1,71,507	9,079	9,079	1,398,400	42,954	3,655,319	324,354	1,00,000	1,00,000	
Chicagoe & Muskingum Valley	148	60,171	181,710	48,921	48,921	83,671	14,850	14,850	18,780	315,263	14,205	6,005,118	231,153	193,071	
Coal & Coke	191	5,44,549	5,44,549	1,67,076	5,862	60,676	11,737	11,737	14,431	23,081	37,265	58,817	11,866	47,785	
Evansville & Indianapolis	149	24,432	122,751	27,990	1,694	39,657	9,571	9,571	15,133	4,273	15,601	12,270	32,448	36,919	
Evansville & Terre Haute	194	1,19,517	44,765	15,457	15,457	1,30,264	1,807,311	1,807,311	195,996	197,342	5,189	10,045	1,010,452	714,594	
Fort Worth & Rio Grande	196	1,48,715	263,254	54,830	5,702	81,072	15,075	15,075	103,100	29,416	399,994	39,806	796,859	82,265	
International Ry. of Great Northern	1,159	4,74,171	1,687,182	46,321	46,321	6,922,267	1,344,812	1,344,812	1,453,303	174,508	3,381,626	204,458	6,58,867	27,8330	
International Ry. of Maine	233	4,74,171	243,037	6,884	6,884	4,922,936	11,989	11,989	12,604	44,024	20,387	6,58,867	51,403	52,330	
Kanawha & Michigan	177	1,64,737	33,737	11,610	2,922,936	443,580	519,589	519,589	25,804	440,272	30,349	1,708,639	314,299	234,870	
Lehigh & New England	167	61,693	55,564	6,131	2,747	65,554	11,514	98,001	10,777	191,516	28,423	425,053	9,450	222,011	
Montana & Southern	226	92,224	162,436	31,192	28,347	1,44,521	20,824	18,597	18,597	34,955	35,791	32,464	14,969	33,878	
Norfolk & Southern	200	13,975	37,779	55,567	4,725	99,652	21,898	21,898	116,288	42,921	72,109	72,109	17,137	30,322	
Mason City & Fort Dodge	386	1,26,491	41,54,481	91,072	24,680	1,796,144	19,532	19,532	21,362	75,336	75,336	70,977	7,723,201	714,594	
Mineral Range	129	4,738,876	5,02,227	1,22,81	4,691	80,607	13,62,18	13,62,18	14,048	3,86,350	3,86,350	14,938	27,71,485	27,71,485	
Mississippi & International	153	1,54,6,911	21,5,693	39,125	8,723	81,0,552	2,22,512	2,22,512	2,60,902	6,906,980	6,906,980	27,71,482	57,932	57,932	
Pittsburgh, Shawmut & Northern	177	4,72,175	17,72,175	29,501	4,71,9	6,88,826	4,316,716	4,316,716	5,91,491	3,91,1	20,942	2,01,915	226,462	226,462	
Missouri Pacific	3,92	14,83,594	4,128,711	1,58,488	398,936	4,08,488	3,130,717	2,68,717	2,68,717	543,458	8,700,156	646,516	4,370,064	89,545	
Mobile & Ohio	125	7,10,957	1,22,376	1,24,886	67,598	9,649,821	1,22,211	1,22,211	1,22,211	1,381,524	322,930	3,618,903	2,812,208	2,60,469	
Montana & Southern	157	5,53,957	16,18,100	32,266	4,715	75,938	11,404	11,404	56,336	5,210	1,86,692	13,375	375,710	15,168	
Norfolk & Southern	582	1,39,411	737,531	33,003	21,027	2,18,972	319,235	319,235	325,503	77,600	132,745	132,745	30,322	67,801	
Northern Pacific	5,649</td														

Car Surpluses and Shortages.

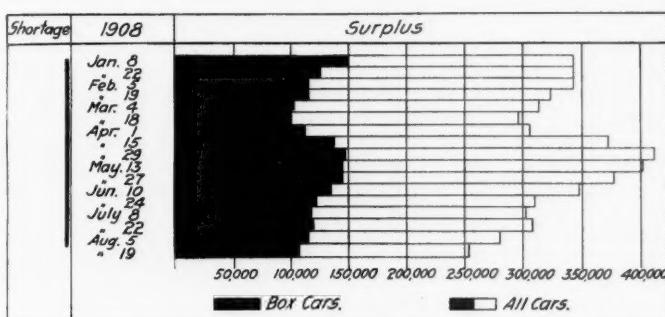
Arthur Hale, Chairman of the Committee on Car Efficiency, has issued Bulletin No. 29-A, giving a statement of car sur-

pluses and shortages, October 30, 1907, to August 19, 1908.

The total of surplus cars for the date of this report is 253,003, a decrease of 28,618 since the last fortnightly report. Of this decrease 7,708 are box cars, 12,044 coal and gondola,

CAR SURPLUSES AND SHORTAGES, BI-WEEKLY, FROM OCTOBER 30, 1907, TO AUGUST 5, 1908, INCLUSIVE.

Date.	Number of roads.	Surpluses.					Shortages.				
		Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
August 19, 1908.....	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908.....	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908.....	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908.....	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908.....	159	147,971	24,350	186,742	54,542	413,605	145	42	16	64	267
March 18, 1908.....	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908.....	161	113,776	30,058	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908.....	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135	738
December 24, 1907.....	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907.....	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907.....	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632	90,757



Car Surpluses and Shortages for 1908.

and 1,910 flat cars. In addition to the decrease in surplus available cars, our reports show a decrease of 5,200 in the number of bad order cars."

The table shows the car surpluses and shortages, monthly, from October 30, 1907, to August 5, 1908, inclusive.

Earnings and Taxes of Texas Railroads.

The following table shows the earnings and taxes of the Texas railroads for the fiscal year ended June 30, 1908. It will be noticed that at the foot of the table the per mile earnings and taxes are given both for Texas and for the United States, and the per cent. of operating expenses to total operating revenue and the per cent. of taxes to total operating revenue are also given.

EARNINGS AND TAXES OF TEXAS RAILROADS.

Name of road.	Mileage operated, fiscal year 1908.	Total operating— Revenues.	Expenses.	Taxes.	Operating Income or Loss.
Acme, Red River & Northern	2.25	\$52,556.72	\$42,276.42	\$3,384.91	\$6,895.39
Beaumont Wharf & Terminal Co.	2.75	34,003.18	27,868.75	910.35	5,224.08
Chicago, Rock Island & Gulf	471.88	3,043,671.32	2,130,369.38	81,847.25	831,454.69
Dallas Terminal Ry. & U. D. Co.	10.26	10,412.00	None.	6,967.11	3,444.89
Denison & Pacific Sub.	7.63	6,930.77	23,503.02	1,050.13	17,562.38*
Durham Transportation Co.	14.00	10,220.53	20,152.82	210.54	10,133.83*
Eastern Texas	30.30	71,313.44	97,396.53	2,413.70	28,496.79*
Elmira & Eastern Transportation Co.	10.00	20,362.43	13,818.67	176.04	6,367.72
El Paso Southern	.44	15,266.01	7,375.86	381.15	7,509.00
Fort Worth & Denver City	454.14	4,574,795.42	3,028,441.24	137,387.05	1,408,967.13
Fort Worth & Rio Grande	195.88	810,943.41	723,201.52	40,366.84	47,375.05
Galveston, Harrisburg & San Antonio	1,342.94	10,556,851.52	8,379,822.75	506,339.27	1,870,689.50
Galveston, Houston & Hend.	50.00	310,268.65	260,368.27	22,915.17	26,985.21
Gulf & Interstate	70.35	96,823.13	302,368.94	3,004.60	208,550.41*
Gulf, Colorado & Santa Fe ¹	1,518.18	11,001,953.19	6,474,546.13	377,150.37	1,150,256.69
Hearne & Brazos Valley	18.68	22,585.64	22,479.93	1,141.57	1,035.86*
Houston & Texas Central	789.01	5,764,080.73	4,398,011.76	230,401.57	1,135,667.40
Houston, East & West Tex.	190.94	1,178,248.81	863,887.71	55,293.23	257,067.87
International & Great Northern	1,159.50	6,922,267.64	6,558,707.43	278,330.37	85,229.84
Kansas City Southern ²	827.04	8,758,928.70	5,754,320.87	283,138.48	2,721,469.35
Livingston & Southeastern	7.20	15,178.10	21,343.64	325.44	6,490.98*
Missouri, Kansas & Texas ³	3,072.00	23,283,669.85	16,432,107.73	688,243.21	6,163,318.91
Moscow, Camden & San Antonio	7.00	10,463.27	12,443.36	722.04	2,702.13*
Orange & Northwestern	61.10	110,124.22	156,938.93	5,729.25	52,543.96*
Pecos River	54.27	40,321.21	59,103.17	1,098,29 [†]	17,683.67*
Pecos & Northern Texas	152.59	810,452.69	645,991.20	18,089.34	146,372.15
Pollock, & Angelina V. T. Co.	10.00	14,826.88	18,806.73	121.22	4,101.07*
Rio Grande R. R. of Texas	22.50	12,833.01	9,448.41	1,285.37	2,099.23
Rio Grande & Eagle Pass	27.00	117,135.20	83,174.24	6,663.24	27,297.72
St. Louis, San Francisco & Texas	124.70	928,234.19	862,593.16	13,113.77	52,527.26
St. Louis, Brownsville & Mexico	442.00	903,378.63	649,426.74	30,390.86	223,561.03
St. Louis Southwestern of Texas	696.80	3,311,394.71	3,575,012.19	110,142.98	373,760.46*
San Antonio & Aransas Pass	723.80	3,157,972.15	2,239,788.21	128,557.08	789,626.86
Southern Kansas Ry. of Texas	125.07	861,727.74	1,126,982.80	16,654.90	281,909.96*
Texas & Gulf	72.43	237,255.15	178,634.71	4,602.73	54,017.71
Texas & New Orleans	449.87	3,731,027.24	2,987,799.39	182,087.36	561,140.49
Texas & Pacific ⁴	1,885.00	14,275,484.66	10,911,204.28	562,067.73	2,802,212.65
Texas, Arkansas & Louisiana	8.00	11,667.15	11,537.65	In litigation.	129.50
Texas Central	268.00	1,009,167.25	826,005.54	24,242.23	158,919.48
Texas Mexican	161.84	267,966.74	242,953.79	16,536.45	8,476.50
Texas Midland	125.15	406,666.52	457,485.66	15,168.32	65,987.46*
Texas Southeastern	20.50	100,755.75	96,834.15	690.99	3,230.61
Texas Southern	72.00	102,101.70	163,693.94	2,546.04	64,188.28*
Trinity & Brazos Valley	421.72	1,075,002.77	1,596,840.03	22,480.04	54,317.30*
Trinity Valley Southern	6.00	23,050.30	22,942.14	2,060.52	1,952.36*
Weatherford, M. W. & N. W.	41.20	150,594.63	74,008.54	6,101.06	70,485.03
Wichita Valley	174.40	531,453.75	314,251.11	9,927.42	207,275.22
Totals	16,398.31	\$108,762,457.70	\$85,908,269.44	\$3,900,261.00	\$18,953,927.26
Per mile of line		6,632.54	5,238.85	237.85	1,155.84
Ratio, per cent.		100.00	78.99	3.59	17.42
United States:					
Per mile of line		10,748.51	7,515.81	371.00	2,861.70
Ratio, per cent.		100.00	69.92	3.45	26.63

^{*}Loss.[†]Credit.² Only 81.10 miles in Texas.³ Only 1.328.73 miles in Texas.⁴ Only 1,130.16 miles in Texas.

Advances in Minimum Weights in Western Territory.

Analysis of the report of the recent meeting of the Western Classification Committee at Manitou, Colo., shows that the total number of advances made in minimum weights on carload shipments was 890. The amount of the increases in minimum weights and the number of commodities affected by each advance are as follows:

Minimum weights advanced from:	No. commodities.	Minimum weights advanced from:	No. commodities.
5,000 to 10,000 lbs...	1	20,000 to 36,000 lbs...	1
8,000 " 10,000 "	1	22,000 " 24,000 "	1
9,000 " 10,000 "	2	24,000 " 26,000 "	5
10,000 " 12,000 "	3	24,000 " 28,000 "	2
10,000 " 14,000 "	1	24,000 " 30,000 "	156
11,000 " 12,000 "	1	24,000 " 36,000 "	29
12,000 " 18,000 "	1	24,000 " 40,000 "	2
14,000 " 15,000 "	2	26,000 " 28,000 "	3
14,000 " 16,000 "	9	26,000 " 30,000 "	20
14,000 " 20,000 "	2	26,000 " 36,000 "	4
15,000 " 20,000 "	1	30,000 " 36,000 "	427
16,000 " 20,000 "	2	30,000 " 34,000 "	9
16,000 " 30,000 "	1	30,000 " 40,000 "	91
18,000 " 20,000 "	1	30,000 " 50,000 "	30
18,000 " 36,000 "	1	30,000 " 33,000 "	1
20,000 " 24,000 "	71	Total	890
20,000 " 26,000 "	1		
20,000 " 30,000 "	8		

Reductions in minimum weights are as follows:

Minimum weights reduced from:	No. commodities.	Minimum weights reduced from:	No. commodities.
14,000 to 12,000 lbs...	1	24,000 to 20,000 lbs...	2
18,000 " 10,000 "	1	30,000 " 14,000 "	1
20,000 " 12,000 "	3	30,000 " 24,000 "	1
20,000 " 18,000 "	1	Total	15
24,000 " 16,000 "	5		

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago Junction has ordered two 6-wheel (0-6-0) switching locomotives from the American Locomotive Co. These will have cylinders 20 in. x 26 in.

CAR BUILDING.

The Harriman Lines are figuring on 132 steel and 19 wooden passenger coaches.

The Chicago, Cincinnati & Louisville is in the market for four passenger coaches.

The Washington Water Power Co., Spokane, Wash., is in the market for 30 electric cars.

The Western Steel Car & Foundry Co., Chicago, is asking prices on specialties for 50 box cars.

The Pacific Traction Co., Tacoma, Wash., is reported in the market for one double-truck car. This item has not been confirmed.

The McGuire-Cummings Manufacturing Co., Chicago, is asking prices on specialties for two combination passenger and baggage cars.

The Ottumwa Railway & Light Co., Ottumwa, Ia., has ordered three semi-convertible cars from the American Car Co. for delivery October 1.

The Atchison, Topeka & Santa Fe is in the market for three composite smoking and passenger cars and 500 30-ton refrigerator cars, 40 ft. long.

The Georgia & Florida is reported in the market for six passenger coaches and a number of freight cars. This item has not yet been confirmed.

The Chicago, Burlington & Quincy is asking prices on material for rebuilding in the company's shops about 10 baggage and mail cars which were recently destroyed by fire in Chicago.

The Carolina, Clinchfield & Ohio is in the market for 1,000 steel gondola cars of 100,000 lbs. capacity in addition to the 10 passenger coaches reported in the Railroad Age Gazette of August 28.

The Houghton County Street Railway, Houghton, Mich., has

given a contract to the Stone & Webster Engineering Co., Boston, Mass., for building an extension and also for supplying new rolling stock.

The Columbus Railway & Light Co., Columbus, Ohio, reported in the Railroad Age Gazette of August 21 as being in the market for 10 large cars, has ordered 10 double-truck cars from the J. G. Brill Co.

The Canton-Hankow has ordered from the Wason Manufacturing Co. 20 third-class passenger cars, 50 gondolas and all the metal material and equipment for 10 additional gondolas. Shipment is to be made from New York about January.

The Wisconsin Central has ordered from Haskell & Barker 2,650 miscellaneous freight cars to be divided as follows:

1,000 box	60,000 lbs. capacity	36 ft. long.
500 box	80,000 "	40 "
500 flat	80,000 "	40 "
250 furniture	80,000 "	40 "
200 vegetable and beer	60,000 "	36 "
100 refrigerator	60,000 "	38 "
50 stock	60,000 "	36 "
50 cabooses		

The Chicago & North-Western has ordered from the Pullman Co. 64 passenger train cars, as follows: One diner, three observation and three vestibule parlor cars, two baggage and buffet cars, ten chair cars, twenty-five vestibule coaches, ten 70-ft. mail and baggage and ten 60-ft. baggage cars. The dining, parlor and buffet cars will be lighted by electricity and the other cars with Pintsch gas. All except the mail cars and baggage cars will be equipped with National steel trap doors and lifting device and Schroyer curtain rolls. The remaining special equipment will be according to standard specifications. Mention of these cars was made in the Railroad Age Gazette of August 28.

The Isthmian Canal Commission will receive bids until September 21 for 200 5-ft. gage, 12-yd., all metal dump cars. These cars will be 19 ft. long, 9 ft. wide and 1 ft. 10½ in. high, inside measurements. The height of body above rail is not to exceed 7 ft. 8 in. Wheel-base to be about 17 ft. 9 in. The special equipment includes:

Axes	Open-hearth steel
Brake-beams	Simplex
Brake-shoes	Streeter, steel-back
Brakes	Westinghouse
Couplers	Malleable; 5 x 5 in. shank
Draft rigging	Miner tandem
Dust guards	Basswood
Journal boxes	McCord

The Chesapeake & Ohio, as reported in Railroad Age Gazette of August 21, has ordered 12 eight-wheel cabooses from the American Car & Foundry Co. These cars will weigh 22,900 lbs. and will be 20 ft. 5 in. long, 7 ft. 10 in. wide, 6 ft. 8¼ in. high, inside measurements, and 26 ft. 8 in. long, 8 ft. 6 in. wide, 13 ft. 10¾ in. high, over all. The bodies will be of wood and the underframe of wood with steel center sills. The special equipment includes:

Axes	4 1/4 x 8 in.
Brake-beams	Monarch
Brake-shoes	Colorado Brake-Shoe & Fdry. Co., steel back
Brasses	C. & O. standard
Couplers	Janney
Curtain material	Pantasee
Draft gear	Miner
Roofs	Ruberoid
Springs	Elliptic

The Lewiston, Augusta & Waterville Street Railway, Lewiston, Me., as reported in Railroad Age Gazette of August 21, has ordered 8 single-end semi-convertible cars from the J. G. Brill Co. These cars will weigh 24,000 lbs. and will have a capacity for 42 passengers. They will be 33 ft. long, 8 ft. wide, 8 ft. 5 in. high, inside measurements, and 42 ft. 6 in. long, 8 ft. 5 in. wide and 12 ft. high over all. The bodies and underframes will be of wood. The special equipment includes:

Brakes	General Electric
Brake-shoes	Streeter
Couplers	Brill
Heating system	Water
Journal boxes	Symington
Roofs	Monitor
Seats	Brill
Seat covering	Rattan
Side bearings	Adjustable
Trucks	Brill 27-E
Wheels	Shoea steel

The Atlantic Coast Line has ordered 500 30-ton, double-felt-lined ventilated box cars from the South Baltimore Steel Car & Foundry Co. These cars will weigh 39,000 lbs. and will

be 36 ft. long, 8 ft. 6 in. wide, and 7 ft. 5 $\frac{1}{2}$ in. high, inside measurements; and 37 ft. 9 $\frac{1}{4}$ in. long, 9 ft. 10 in. wide, and 11 ft. 11 $\frac{3}{4}$ in. high, over all. Bodies will be of wood and underframes steel. The special equipment includes:

Bolsters, body and truck.....	Structural steel
Brakes	Westinghouse, K. C. 812
Brake-beams	Pennsylvania
Couplers	Steel; 5 x 5 in. shank
Doors, side	Solid and ventilated
Doors, end	Double
Door fastenings	A. C. L. standard
Draft gear	Westinghouse friction and Farlow attachment
Dust guards	Harrison
Journal boxes	National Malleable Castings Co.
Paint	A. C. L. standard
Roofs, outside	Metal
Side bearings	Adjustable
Springs	A. C. L. standard
Trucks	A. C. L. standard
Wheels	33-in. chilled cast-iron

IRON AND STEEL.

The Tennessee Central has ordered 1,000 tons of rails from the Illinois Steel Co.

The Midland Valley has ordered 500 tons of rails from the United States Steel Corporation.

The Delaware, Lackawanna & Western has ordered about 1,400 tons of light rails from the Lackawanna Steel Co.

The Canadian Pacific has ordered 85,000 tons of 85-lb. rails from the Lake Superior Corporation, for early delivery.

The Harriman Lines have given a contract to the American Bridge Co. for 10,000 tons of bridge steel to be covered by specifications during the next six or eight months.

RAILROAD STRUCTURES.

AMARILLO, TEX.—The Texas Railroad Commission has approved the plans of the Chicago, Rock Island & Pacific for a new passenger station. The plans call for a stone building.

CHICAGO, ILL.—The Chicago & North-Western has given a contract to Henry Bernaritter, 160 Washington street, Chicago, for a brick shop building, 25 ft. x 138 ft., to be built on Fortieth avenue, Austin. The structure will cost \$14,000.

DENVER, COLO.—An officer writes that the plans of the building for the Union Depot Co. have not as yet assumed any definite shape. (August 14, 1908, p. 733.)

DETROIT, MICH.—Good progress is being made in the construction of the Michigan Central tunnel under the Detroit river. Five of the ten double-tube sections of the sub-aqueous portions have been placed, and it is expected that two more will be put down before a suspension of the work, due to cold weather. The contractors expect to have the tunnel completed by next June.

DILLON, MONT.—The contract recently let by the Oregon Short Line to the Campbell Building Co., Salt Lake City, Utah, calls for a brick and concrete passenger station, one story high, 45 ft. x 138 ft., to cost \$19,000. Work to be begun at once. (August 21, p. 781.)

EVERETT, WASH.—The contract for the passenger station to be built for the Great Northern has been given to Henry Chase, Tacoma, Wash. The station is to cost \$100,000. (July 17, p. 549.)

GALVESTON, TEXAS.—Local papers publish a proposed contract which the railroads have submitted to Galveston county relative to the causeway and bridge facilities which the county proposes to build across Galveston bay. Three steam and an interurban road desiring the right to use the causeway are the Gulf, Colorado & Santa Fe, the Galveston, Houston & Henderson, the Galveston, Harrisburg & San Antonio, and the Galveston-Houston Electric. It will be recalled that all of the bridges across the bay were destroyed in the storm of 1900, and that the wooden rebuilt Santa Fe trestle has been the only crossing since that time. The proposed causeway, according to the newspaper accounts, is to cost not more than \$1,400,000, and the railroads are each to pay the county one-sixth of the cost of its construction. The contract provides

that the Santa Fe be allowed \$100,000 in compensation for the loss sustained in abandoning and dismantling its present bridge, this sum to be included in the cost of the new crossing. It is the opinion that the proposed contract will be accepted by the county, except for some minor changes. (July 31, p. 641.)

GREENVILLE, PA.—The Bessemer & Lake Erie has plans made for a new steel railroad bridge.

MINNEDOSA, MAN.—The Canadian Pacific roundhouse, which was destroyed by fire, will, it is said, be rebuilt at once.

MINOT, N. DAK.—Plans for a freight house, 50 ft. x 300 ft., are being prepared for the Minneapolis, St. Paul & Sault Ste. Marie. The building is to be a two-story structure and to cost \$35,000.

MOHAWK, MICH.—See Houghton County Street Railway under Railroad Construction.

MUSKEGON, MICH.—The Grand Rapids, Grand Haven & Muskegon (electric), Grand Rapids, Mich., will build a new \$15,000 depot at its terminal on Seventh street.

NASHVILLE, TENN.—The Nashville, Chattanooga & St. Louis, it is said, will rebuild several bridges near Nashville at a cost of \$20,000.

NATCHEZ, MISS.—An officer of the Mississippi Central is quoted as saying that plans for a concrete and brick station will be ready soon, and that work on the building will begin about October 1. The date for receiving bids for the work has not been announced.

QUEBEC, QUE.—The board of engineers which the Canadian Government appointed to prepare plans, superintend and supervise the work of construction of the Quebec bridge to replace the one which collapsed a year ago, held its first meeting in Ottawa, Ont., last week. It is said that the wrecked bridge will be sold for scrap, the plans destroyed and the work begun entirely anew. The cost of the new structure is given as \$10,000,000. The Government will have full control of the work through the Department of Railways and Canals, no outside capital being used. When completed, the bridge will be leased to the National Transcontinental Railway, and it is expected the revenues will pay 3 per cent. on the total investment. (Aug. 21, p. 782.)

SAPULPA, OKLA.—The St. Louis & San Francisco and the city of Sapulpa will build two viaducts, each 24 ft. wide, across the railroad tracks. The railroad will build the viaducts proper and the city the approaches.

TAMPA, FLA.—Work on the new terminal facilities of the Seaboard Air Line is now in progress. See detailed account in another column. (Aug. 28, p. 830.)

WICHITA, KAN.—The Kansas City, Mexico & Orient is having plans made for a 21-stall brick roundhouse; a machine, blacksmith and erecting shop of brick, 153 ft. x 334 ft.; a brick power house, 85 ft. x 90 ft., and a brick transfer table, coach, tank and carpenter shop, 120 ft. x 200 ft.

SIGNALING.

Hall Signals on the Boston & Albany.

The Boston & Albany has given to the Hall Signal Co., New York, an order for Style F electric motor automatic block signals to equip 113 miles of track. These signals, when installed, will complete the automatic block signaling of the whole of the main line of the road; but the mileage named includes that part of the line between Chester and North Adams Junction on which banner signals are already in use. These are to be taken out. The new signals are to be arranged with "normal danger" circuits, the distant signals to be controlled by wires. Hall upper-quadrant semaphores will be used. Each post will have a home and distant signal, and there will be no overlap. Sections which are over 4,000 ft. long will be made "cut sections" with wire control. The principal districts to be covered by the new signaling are from Rensselaer to Niverville; Chatham to Canaan Tunnel; Richmond to Pittsfield; Chester to Westfield and the mountain section before mentioned.

SUPPLY TRADE NOTES.

F. S. Hitchcock has been elected Vice-President and General Manager of the MacArthur Brothers Co., Chicago.

The National Appliance Co., Chicago, has been incorporated with a capital stock of \$5,000 to deal in railroad specialties. The incorporators are: C. C. Murphy, B. D. Jones and E. C. F. Meier.

In the fire which destroyed the Wheeling & Lake Erie shops at Norwalk, Ohio, on August 23, the entire catalogue file was lost. J. E. O'Hearne, Master Mechanic at Norwalk, asks that manufacturers and others send copies of their catalogues to him.

Alex. S. Mitchell, with offices at 45 Broadway, New York, has been appointed to represent the Champion Rivet Co., Cleveland, Ohio, in New York City and the surrounding territory. This company handles the Victor boiler, ship and structural rivets.

A new office has been opened in the Gumbel building, Kansas City, Mo., by the Crocker-Wheeler Co., Ampere, N. J., for the sale of Crocker-Wheeler motors, dynamos, transformers, switch-boards, etc. The office is in charge of A. W. Paine, who will attend to business in Kansas City and vicinity.

The Atkinson Foundry & Car Shops, St. Albans, W. Va., has let contracts for erecting a saw tooth frame building, 98 ft. x 128 ft., and car shop, 40 ft. x 80 ft., and other small buildings. Contracts have also been awarded for the mechanical equipment necessary. This company was recently organized with a capital stock of \$25,000.

George Wagstaff, formerly supervisor of boilers, New York Central Lines, has taken a position with the American Locomotive Equipment Co., Chicago, and not with the Railway Materials Co., Chicago, as recently stated in these columns. His position with the American Locomotive Equipment Co. is that of Eastern Representative, with headquarters in New York.

The McMyler Manufacturing Co., Cleveland, Ohio, has been given a contract by the Toledo & Ohio Central for a McMyler car dumping plant to be erected at Toledo. The company has also received contracts from the Delaware, Lackawanna & Western for a 15-ton gantry crane to be erected at Hoboken, N. J., and from the Builders' Supply Co., Detroit, Mich., for a locomotive crane for its sand handling plant.

The Western Sheet & Structural Iron Works, Salt Lake City, Utah, is being organized with a capital stock of \$150,000 to build a plant and manufacture sheet and structural iron. It is said that a site has been purchased and that within forty days work will begin on the erection of the works. Charles H. Henderson, President of the Salt Lake Construction Co., Atlas block, Salt Lake City, Utah, is promoting the company. Others interested include Frank Simmons, G. S. Barr and F. A. Fafeck.

F. A. Dilworth, Jr., Assistant General Manager of Sales of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., died at St. Vincent hospital, Birmingham, on August 27, after a short illness of typhoid fever. Mr. Dilworth was for 13 years with the Carnegie Steel Co., Pittsburgh, Pa., serving at Pittsburgh, Pa.; Boston, Mass.; New York; Atlanta, Ga., and other places. He went to Atlanta in 1907, representing the Carnegie Steel Co. and the Illinois Steel Co., Chicago. When the United States Steel Corporation acquired the Tennessee company, Mr. Dilworth was transferred to Birmingham.

TRADE PUBLICATIONS.

Graphite.—The September issue of this publication of the Joseph Dixon Crucible Co., Jersey City, N. J., contains an article entitled "Prolonging the Life of Crucibles," by Dudley A. Johnson.

Electric Motors.—Bulletin No. 159, issued by the B. F. Sturtevant Co., Hyde Park, Mass., describes type H electric motors, specially designed for direct connection to Sturtevant blowers and exhausters.

Boilers.—Gustav Wiedeke & Co., Dayton, Ohio, is distributing a calendar containing some information helpful to boiler makers. The company will be pleased to send a calendar to anyone interested.

Air Compressors.—Advance sheets of catalogue No. 26 of the Chicago Pneumatic Tool Co., Chicago, include a number of pages of tabulated data regarding the Franklin steam and belt-driven air compressors.

Pumps.—A complete description of the Thirty-ninth street sewage pumping station, Chicago, and illustrations of the centrifugal pumps installed, are given in Bulletin No. 1611 of the Allis-Chalmers Co., Milwaukee, Wis., a copy of which may be had upon application.

Valves and Fittings.—The July-August issue of *The Valve World*, published by the Crane Co., Chicago, contains an article describing the Main street and West End, Bridgeport, Conn., plants of this company, being one of a series of articles showing the growth of the company.

Reinforced Concrete Beams.—Rigidly connected diagonal shear reinforcement vs. loose vertical stirrups, is the subject discussed in a small pamphlet issued by the Trussed Concrete Steel Co., Detroit, Mich. The publication includes the report of tests of reinforced concrete beams made at the University of Wisconsin.

Atchison, Topeka & Santa Fe.—The Sixteenth National Irrigation Congress and Industrial Exposition to be held at Albuquerque, N. Mex., September 29 to October 10, is the subject of a very attractive pamphlet issued by the Santa Fe. Anyone interested in this convention will find a considerable amount of helpful information, together with a description of the country surrounding Albuquerque.

How to Burn Illinois Coal Without Smoke.—The first edition of this bulletin (No. 15) of the Engineering Experiment Station of the University of Illinois, Urbana, Ill., which was published last December, has been exhausted. On account of the large number of requests for it, a second edition of 10,000 copies has been published, and copies may be had free by applying to the Director of the Station.

Hoisting Engines, Etc.—The sixth edition catalogue for 1908 of the S. Flory Manufacturing Co., Bangor, Pa., has just been issued. It is 9 1/4 in. x 12 in., bound in heavy paper and contains 170 pages. The catalogue illustrates and describes steam and electric hoisting engines for use in mines and general contracting work; also suspension cableways and machinery for logging and slate working.

Indicators.—The 1908 catalogue of the American Steam Gage & Valve Manufacturing Co., Boston, Mass., describes especially the Thompson improved steam engine indicator, giving detailed descriptions of the various parts, the method for testing indicator springs, etc. The catalogue also describes the American Ideal reducing wheels, Amsler's polar planimeter, and other indicator accessories. A number of pages are devoted to the use of the steam engine indicator in connection with engine performance.

Carbonizing Coating and Carbon Cement.—The Goheen Manufacturing Co., Canton, Ohio, is distributing in pamphlet form a report of the tests of the spreading power of carbonizing coating, red lead and graphite paints, made at the Columbus shops of the Pennsylvania Railroad, in 1906, by William T. Magruder, M.E., Professor of Mechanical Engineering, Ohio State University. The publication treats of the tests made and the spreading power of paints, and gives a detailed summary of the tests and costs of materials in cents. A number of bridges, viaducts and factories are shown that are protected by carbonizing coating.

Protected Sheet Steel.—The Asbestos Protected Metal Co., Canton, Mass., has recently issued its No. 4 catalogue, 30 pages, describing in detail Asbestos Protected Metal, a roofing and siding material which is now being used extensively on coaling stations, train sheds, canopies, chemical works and industrial plants. The catalogue contains half-tone illustrations of many representative pieces of work. This company has also issued Catalogue No. 48-A, illustrating and describing the Robertson standard box car roof, which is an inside roof.

constructed of Asbestos Protected Metal. Copies of these catalogues will be sent upon application to the main office or to the Chicago office of the company, Old Colony building.

Flint Rim Sprocket Wheel.

The accompanying illustration shows a section of a sprocket wheel rim which has been developed to meet conditions too severe for the use of the regular type of cast iron wheel, such as when abrasive materials are handled in conveyors. The teeth and that part of the rim which is subjected to wearing action of the chain are hardened to a considerable depth, the surface being made smooth and uniform. This improvement



Section of Sprocket Wheel Rim.

in the sprocket wheels not only makes the wheel more durable, but actually prolongs the life of the chain by maintaining the original accuracy of fit between the links and the sprocket teeth. The trade name "Flint Rim" has been coined and copyrighted for the new sprocket wheels by the Link-Belt Co., Philadelphia, Pa. These wheels are available for most sizes of the Ewart type chains.

Crown Type Truck Bolster.

The accompanying illustration shows the general design of a 100,000-lb. Crown type truck bolster, manufactured by the Gould Coupler Co., New York. This type of bolster can be made to suit any type of pedestal truck. The web members



Gould Crown Truck Bolster.

of the truss are inclined inward so that the cross section of the bolster is a flat V-form that makes it strong and light, with the desired flexibility. This bolster does not have the rigidity of other forms, and has a longer life because of less change in the structure of the steel. The increased width at the center plate and the V-form give a great transverse strength and allow for increased depth at the center plate, increasing the depth of the truss, as the tension member is of proper width to allow free clearance between the flanges of the common inverted channel beam or angles forming the truck cross tie and spring seats. The side bearings, center plate and dead lever fulcrum bracket may be cast integral with the bolster.

An average compression test on a 60,000-lb. bolster showed no permanent set at 100,000 lbs., the ultimate breaking load being between 200,000 lbs. and 250,000 lbs. A similar test

on an 80,000-lb. bolster showed no permanent set at 150,000 lbs., with an ultimate breaking load of between 300,000 lbs. and 350,000 lbs., while a 100,000-lb. bolster showed no permanent set at 150,000 lbs., with an ultimate breaking load of between 325,000 lbs. and 400,000 lbs.

Traveling Engineers' Supply Men's Association.

On the afternoon of the first day of the Traveling Engineers' convention the supply men present met in the parlors of the Cadillac Hotel and organized the Traveling Engineers' Supply Men's Association. The meeting was largely attended. After voting to establish a permanent organization a tentative constitution, recommended by several leading supply men, was formally adopted. It was reported that 42 supply companies were represented at the convention and each had contributed \$25 toward the expenses of the gathering. Officers for the ensuing year were elected as follows: President, J. C. Curry, Nathan Manufacturing Co., New York; Secretary, S. D. Hutchins, Westinghouse Air Brake Co., Pittsburgh, Pa.; Treasurer, Mark A. Ross, Pyle-National Electric Headlight Co., Chicago. Members of the Executive Committee to serve for three years: S. D. Hutchins; F. W. Edwards, Ohio Injector Co., Chicago, and C. B. Moore, American Locomotive Equipment Co., Chicago.

The exhibits were shown in a parlor adjoining the convention hall and in rooms along the corridor leading thereto. They were as follows:

Detroit Lubricator Co., Detroit, Mich.—One, two, three, four, five and seven-feed locomotive lubricators; single and double sight-feed air cylinder lubricators; Norvall packless valve for steam heat and radiation; sectional No. 21 lubricator. Represented by A. B. Wetmore, A. D. Howard, J. P. Tiernan and Herbert Lord.

Detroit Seamless Steel Tubes Co., Detroit, Mich.—Samples of locomotive boiler flues. Represented by R. R. Owen.

Joseph Dixon Crucible Co., Jersey City, N. J.—Samples of Dixon's flake graphite for lubricating locomotive bearings; catalogues and general literature. Represented by F. R. Brandon.

The Flannery Bolt Co., Pittsburgh, Pa.—The Tate flexible staybolt and tools for the application of same, including taps, reamers, etc. Photographs of the use of the Tate staybolts on various roads. Represented by B. E. D. Stafford and T. R. Davis.

Franklin Railway Supply Co., Franklin, Pa.—The new Franklin power grate shaker for locomotives, full size. Horizontal pneumatic fire door now in use on many roads. No. 4 driving box grease lubricator. Represented by A. G. Elvin and W. H. Coyle.

Greene, Tweed & Co., New York.—Palmetto packing and the Favorite reversible ratchet wrench. Represented by H. S. Demarest, F. E. Ransley and B. M. Bulkley.

Jenkins Bros., New York.—Regular line of valves, and special valves for high pressure superheated steam. Represented by B. J. Neely.

McCord & Co., Chicago.—The McCord force-feed system of lubrication, full size and in operation. Represented by Morrill Dunn and H. H. Newsom.

George B. Maltby, Cleveland, O.—Ohio metallic packing with graphite lubricated segment rings. The Thompson hose clamp made by the Thompson Manufacturing Co., Newark, O. Represented by George B. Maltby and J. L. Dowell.

Michigan Lubricator Co., Detroit, Mich.—Double, triple, four, five and seven-feed lubricators. The seven-feed lubricator is a new one and is designed for feeding the air cylinder of the air pump. Also a new automatic train valve; air brake and air compressor lubricators, and lubricators for stationary engines. Represented by W. E. Bryant.

The Nathan Manufacturing Co., New York.—New triple sight-feed lubricator and the Phillips double boiler check. Represented by J. E. Minor, J. C. Curry and Clifford Nathan.

The Pilliod Co., Swanton, O.—Quarter-size working model of the Baker-Pilliod locomotive valve gear. Represented by F. E. and C. J. Pilliod.

Wheel Truing Brake Shoe Co., Detroit, Mich.—Various types of shoes for truing locomotive driving wheels. Represented by J. M. Griffin.

The Decline in Pig Iron.

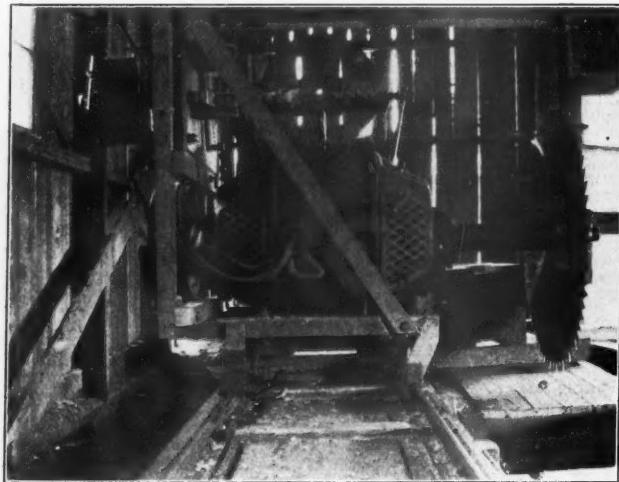
The value of the pig iron production in 1907 at \$20.59 per ton, the official Washington estimate, was \$529,958,000. The rate of production has been cut nearly in two this year, and the value of iron has also declined. The value of pig iron produced in Pennsylvania last year was \$234,952,000. Ohio's pig iron output was valued at \$106,387,000. The value of iron of these two States is likely to fall off \$200,000,000 in 1908, unless there is rapid recovery in the price and output in the last four months.

The value of each State's production of pig iron last year was: Alabama, \$30,100,000; Illinois, \$52,229,000; New Jersey, \$7,554,000; New York, \$33,097,000; Ohio, \$106,387,000; Pennsylvania, \$234,952,000; Tennessee, \$7,542,000; Virginia, \$8,963,000; Colorado and Missouri, \$11,628,000; Connecticut and Massachusetts, \$663,000; Georgia and Texas, \$1,181,000; Indiana, Michigan, Minnesota and Wisconsin, \$18,829,000; Kentucky, Maryland and West Virginia, \$16,833,000.

Portable Contractors' Saw.

The use of an electric motor for driving a portable tool for contractors' use is illustrated herewith in a 10-h.p. d. c. motor, on the extended shaft of which is mounted a circular saw. The motor was made by the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., and differs from the standard Westinghouse design of type S motor only in that the shaft is larger and longer on the pulley end, and that a commutator end bracket is supplied to provide a bearing near the saw. The motor speed may be varied from 1,125 r.p.m. to 1,800 r.p.m. to provide for various classes of work, using saws of different diameters. A pulley is placed on the extended shaft to act as a flywheel, and also to provide a place for a brake. This latter is thrown on by a lever near the operator whenever it is desired to stop the saw quickly. In this installation there is a bladed fan on the pulley to blow air over the motor and throw the chips and sawdust away from the track and the motor.

The illustration shows a large circular rip saw taking a cut in a heavy oak timber to be used in dam wickets on the Ohio river. Similar use of this motor may be made in connection with a crosscut saw or groove cutter. The motor is mounted on a frame with wheels which run on a short piece of track, and the saw is fed through the work by pressure exerted against the horizontal wrapped handle which appears above



Circular Saw Driven by 10-H.P. Motor.

the motor. In front of all four wheels a flap of leather is arranged to rub on the track, which effectually clears away all waste material and allows the groove cutter to make a cut of even depth at all times. Mounted on the frame which carries the motor is the switchboard panel with a field rheostat for speed adjustment, a starting rheostat and a circuit breaker. As the motor must move back and forth, the current is supplied through two short stretches of trolley wire similar to the method used in a traveling crane. From the illustrations it is apparent that the motor is not installed under ideal conditions, as little protection from the weather is provided, but it shows to what purposes motors may be put. The entire outfit is intended by the contractor for portable service, current being supplied from a gas engine driven generator, which is also mounted for ready handling. There is also a small air compressor which supplies a pneumatic drill.

Maintenance of the Electric Locomotive.

At this early date of electric locomotive operation it is not possible to make exact figures on the maintenance, owing to the fact that we are not able as yet to determine what would constitute a general overhauling. However, we believe that the largest items in the general overhauling will be the turning of the tires and the painting of the locomotives. The latter, no doubt, will limit the time of the locomotive out of shop, instead of the tire wear. It is a fact that the tire wear on electric locomotives is but $\frac{1}{2}$ in. for 30,000 miles, as com-

pared to 8,000 or 9,000 miles on the steam locomotives. Should it ever be decided to shop the electric locomotive on the tire wear basis, it would mean that the locomotive would run approximately 210,000 miles between general overhauling.

However, the running maintenance of the electric locomotive is much lower than that of the steam locomotive, owing to the fact that the electric locomotive is not given the round-house inspection at the end of each day's work; they are inspected on a 1,000-mile basis, which at present means once in every ten days. This inspection is similar to the practice in steam locomotive inspection to a certain extent; the locomotive is taken in the shed on a pit, and the inspection is begun by first blowing out the electrical apparatus with an air blast. The motors are then examined, the commutators, contactors, switches and controllers are cleaned. The control system is inspected and checked; in fact, every part of the electrical apparatus thoroughly examined. The contact shoes are gaged, the journals oiled, and the locomotive is ready for service again. The actual time required to inspect an electric locomotive is on an average of about 3½ hours. There is no preliminary work on these electric locomotives before making inspection, as there is no fire cleaning, coaling or watering; sanding, of course, is necessary.—*J. P. Kelley before the Traveling Engineers' Convention.*

Railroad Officers.**ELECTIONS AND APPOINTMENTS.****Executive, Financial and Legal Officers.**

John W. Dixon has been appointed Assistant General Solicitor of the Erie, with office at 50 Church street, New York.

James Copland has been appointed Freight Claim Agent of the Southern Pacific lines in Oregon and of the Oregon Railroad & Navigation, with office at Portland, Ore., succeeding G. M. Glines.

J. H. Pusch, Freight Claim Agent of the International & Great Northern at Palestine, Tex., has been appointed Chief Clerk under W. L. Maury, Auditor, the jurisdiction of the freight claim department having been transferred to the accounting department. All correspondence regarding claim matters should be addressed to the Auditor.

Operating Officers.

W. C. C. Mehan has been appointed Superintendent of the Grand Trunk Pacific at Melville, Sask.

John Mahoney has been appointed Trainmaster of the Chicago & Alton at Springfield, Ohio, succeeding E. H. Junod, resigned.

H. A. Vaughan has been appointed General Superintendent of the Texas-Mexican, with headquarters at Laredo, Tex., succeeding Font Rice.

T. P. Sexton, Car Distributor on the Peoria & Eastern division of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned to engage in other business.

E. O. Griffin has been appointed to represent the Texas Car Service Association at Galveston, Tex. He will attend to the assessment and collection of demurrage which accrues on the tracks of the Galveston Wharf Co. and the Southern Pacific Terminal Co.

H. H. Brown, Superintendent of the Eastern division of the St. Louis & San Francisco at Springfield, Mo., has been appointed Superintendent of the Kansas division, with headquarters at Neodesha, Kan., in place of Le Roy Kramer, transferred to the Central division, with headquarters at Fort Smith, Ark. A. O'Hara, formerly Superintendent of the Eastern division, will resume his old office, succeeding Mr. Brown. G. H. Schleyer, Superintendent of the Central division, will be transferred to the Western division, with headquarters at Enid, Okla., in place of A. J. Sams, assigned to other duties.

The Rome, Watertown & Ogdensburg division of the New York Central & Hudson River, 680 miles long, will be divided on September 20 into two divisions, to be known as the Ontario division and the St. Lawrence division. F. E. McCormack, Assistant Superintendent of the present R., W. & O. division, has been appointed Superintendent of the Ontario division with headquarters at Oswego, N. Y. The Ontario division includes territory west and south of Watertown, including Niagara Falls. C. Christie, Superintendent of the present R., W. & O. division, has been appointed Superintendent of the St. Lawrence division, with office at Watertown. The St. Lawrence division includes territory north of Watertown and Utica, N. Y.

Traffic Officers.

Alfred Darlow, Advertising Agent of the Union Pacific at Omaha, Neb., has resigned to engage in other business.

C. W. Tolliver has been appointed Joint Agent of the Louisville & Nashville and the Atlanta, Birmingham & Atlantic at Birmingham, Ala.

H. A. Jordan, Commercial Agent of the Central of Georgia, has been appointed General Freight and Passenger Agent of the Wadley Southern, with office at Swainsboro, Ga.

W. A. Clawson, whose resignation as City Ticket Agent of the Canadian Pacific has been announced in these columns, has returned to the Southern Pacific, going into the rate department.

Alberto Clausen, whose resignation as Customs House Agent of the Sonora Railway was announced in these columns, has opened a general customs house brokerage office at Nogales, Son., Mex.

D. J. Byars, Assistant Commercial Agent of the International & Great Northern at Fort Worth, Tex., has been appointed Acting Commercial Agent at Fort Worth, Tex., succeeding R. B. Webb.

George W. Winters, Manager of the Beaumont, Tex., Freight Bureau, has been appointed General Freight and Passenger Agent of the Orange & Northwestern, succeeding J. W. Parker, assigned to other duties.

F. J. McDonald, Traveling Freight and Passenger Agent of the Southern Pacific at the City of Mexico, will temporarily take charge of the office of General Agent at Monterey, Mex., in place of H. N. Gibson, deceased.

In addition to his duties as General Southern Agent of the Erie Despatch, H. H. Cage will hereafter represent the Erie Railroad as General Southern Agent in charge of freight and passenger traffic at Memphis, Tenn.

F. E. Potts has been appointed Soliciting Freight Agent of the Atchison, Topeka & Santa Fe at Beaumont, Tex., succeeding Melvin Thompson, promoted to the position of Soliciting Freight Agent at San Antonio, Tex.

Torrence Kight, Soliciting Freight Agent of the Gulf, Colorado & Santa Fe, has been appointed Traveling Freight Agent at San Antonio, Tex. Melvin Thompson, Assistant Freight Agent at Beaumont, Tex., succeeds Mr. Kight at San Antonio.

Charles A. Bland, Traveling Freight Agent of the Georgia Railroad, at St. Louis, Mo., has been appointed General Freight and Passenger Agent of the Liberty-White Railroad, with office at McComb City, Miss., succeeding S. B. Paton, resigned.

The jurisdiction of Riley Williams, Terminal and Lighterage Agent of the Delaware, Lackawanna & Western, has been extended to include the work heretofore performed by the foreign freight agency, except those duties assigned to the Export and Import Freight Agent.

C. L. Guest, New England Freight Agent of the Lehigh Valley, has been appointed West Bound Freight Agent, with office at 707 Railway Exchange, Chicago. J. H. McCrea succeeds Mr. Guest, with offices at 262 Washington street, Boston, Mass., and 39 Church street, New Haven, Conn.

C. H. Stinson, whose appointment as General Freight Agent of the Wabash has been announced in these columns, was born at Beaver Falls, N. Y., in 1871. He began railroad work

in 1885 on the Chicago, Milwaukee & St. Paul, and went into the freight department of the Wabash in 1890. In December, 1906, he was appointed Assistant General Freight Agent of this road, with headquarters at St. Louis, Mo., from which position he has now been promoted to General Freight Agent.

J. D. McNamara, whose promotion from Assistant General Passenger Agent of the Wabash to General Passenger Agent was recently announced in these columns, was born at Keokuk, Iowa, in 1871, and began railroad work in 1885 as ticket checker on the Chicago, Burlington & Quincy. In 1891 he worked in the accounting department of the same road, and in 1893 was appointed chief division clerk in the passenger department at St. Joseph, Mo. Later in the same year he was transferred to St. Louis, Mo., as chief rate clerk, and in 1896 was appointed chief clerk to the General Passenger Agent. In 1905 he became Southwestern Passenger Agent, with headquarters at Kansas City, and was appointed Assistant General Passenger Agent of the Wabash in January, 1906, from which position he is now promoted.

Engineering and Rolling Stock Officers.

James Martin, Master Mechanic of the Liberty-White Railroad, has resigned.

George W. Davis has been appointed Signal Engineer of the Chicago & Alton, succeeding William Davis, resigned.

H. C. May has been appointed Master Mechanic of the Louisville & Nashville at South Louisville, Ky., succeeding W. L. Tracy, resigned.

H. V. Wallingford, Inspector of Bridges and Buildings of the Atchison, Topeka & Santa Fe Coast Lines at San Bernardino, Cal., has resigned.

W. O. Houston has been appointed Chief Engineer of the New Orleans Great Northern, with offices at Covington, La. M. Houston reports direct to the General Superintendent.

N. E. Baker, recently appointed Signal Engineer of the Illinois Central, was born November 12, 1877, at Bronte, Ontario, Can., and received his education in the public and high schools at Cayuga, Ont.

He began signal work in September, 1901, in the employ of the Hall Signal Co., New York, assisting in installing signals between Kensington and Kankakee, Ill., on the Illinois Central. On the completion of this work he resigned, January 10, 1901, and entered the service of the Illinois Central as Signal Maintainer, at Matteson, Ill. On June 27, 1901, he resigned from the Illinois Central to again go with the Hall Signal Co., this time as Foreman on signal construction.

On September 1, 1905, he was appointed Assistant Signal Engineer of the Illinois Central, which position he held until his recent appointment as Signal Engineer. Mr. Baker is a member of the Railway Signal Association, and is one of the Committee on Specifications for Power Interlocking. He is also a member of the American Railway Engineering and Maintenance of Way Association.

H. F. Lomas has been appointed Assistant Signal Engineer of the Illinois Central, succeeding N. E. Baker. Mr. Lomas was born in Derbyshire, England, in October, 1871. Coming to this country in 1893, he began work in the construction department of the Union Switch & Signal Co., Swissvale, Pa. From 1895 to 1900 he was Signal Maintainer of the Chicago & North-Western at the Wells street station, and also Foreman of a signal construction gang. In 1900 he went to the



N. E. Baker.

General Railway Signal Co., Rochester, N. Y., as Foreman, leaving this position in 1904 to become Signal Inspector of the Chicago, Rock Island & Pacific. In 1906 he was appointed Signal Inspector of the Illinois Central, which position he held until his present promotion. D. R. Morris is appointed Signal Inspector, succeeding H. F. Lomas. All appointments effective September 1.

E. W. Kolb, Supervisor of Signals of the Nebraska division of the Union Pacific, has been appointed Engineer of Electrical Signals of the Chicago, Rock Island & Pacific. He will have supervision over construction, changes and inspection of electrical signal apparatus. E. J. Relph, Inspector of Signals, has had his title changed to Interlocking Engineer.

W. L. Tracy, formerly Division Master Mechanic of the Louisville & Nashville at South Louisville, Ky., has been appointed Assistant Superintendent of Machinery of the Missouri Pacific, with headquarters at Kansas City, Mo. B. J. Peasley has been appointed Master Mechanic of the Missouri Pacific at Ferriday, La., succeeding J. Schumacher, transferred.

Special Officers.

Alfred Darrow, Advertising Manager of the Missouri Pacific, has resigned to engage in other business.

Purchasing Officers.

A. C. Merry, Purchasing Agent of the Chicago Terminal Transfer, has resigned, and his office has been abolished.

OBITUARY.

Adams Bardsley, former Master Mechanic of the Buffalo, Rochester & Pittsburg, died recently. Mr. Bardsley began railroad work in England, and when he was seventeen went to Egypt, where he worked in the mechanical engineering department of different railroads. Later he came to America and worked 20 years for the Northern Pacific. In 1903 he was made Master Mechanic of the Buffalo, Rochester & Pittsburgh, and later was a salesman for the American Locomotive Co. His last position was as Master Mechanic of the Gulf & Ship Island, from which he resigned on account of poor health.

Elbridge H. Beckler, Civil Engineer in charge of construction of the Pacific extension of the Chicago, Milwaukee & St. Paul, died at Missoula, Mont., his temporary headquarters, on August 27, at the age of 54 years. He was born at Buckfield, Me., and was educated at the Maine State College of Agricultural and Mechanic Arts. He began railroad work in 1879 as transitman in a party locating the Fergus Falls branch of the St. Paul, Minneapolis & Manitoba, now part of the Great Northern. From 1880 to 1884 he was successively Assistant Engineer on location and Resident Engineer on construction on the Yellowstone and Rocky Mountain divisions of the Northern Pacific. He was Division Engineer of the Canadian Pacific from 1884 to 1885, and then for a short time was Resident Engineer of the Northern Pacific near Duluth, Minn. From 1886 until 1891 he was Resident Engineer, Assistant Chief Engineer and Chief Engineer of the Montana Central, and from the latter year until 1893 was Chief Engineer of the Montana Central and the Pacific Coast extension of the St. Paul, Minneapolis & Manitoba. In 1894 he was Chief Engineer in charge of construction of the United Verde & Pacific in Arizona, after which he became a Consulting Engineer in Chicago. Later he became associated with the Winston Brothers Co., Minneapolis, and has been with that company ever since. In 1897 he had charge of the double-tracking of the Madison division of the Chicago & North-Western, and in 1899 had charge of the extension of the Chicago & North-Western from Burt, Ia., to Sanborn, Minn. In 1901 he was connected with the construction work of the Verdigris extension of the Chicago & North-Western in Nebraska and South Dakota, and in 1905 was engaged in some heavy construction work in Louisiana. In 1906 and 1907 he worked on some extensive irrigation projects in the vicinity of Calgary, Alta., since which time he had been in charge of the most difficult construction of the Pacific Coast extension of the St. Paul, building that part through the Bitter Root mountains in Montana.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALBUQUERQUE & EASTERN.—It is said that arrangements have been completed for building this line from Moriarty, N. Mex., on the Santa Fe Central, west via Frost to Albuquerque and thence northeast to Hagan, total distance about 75 miles.

ARKANSAS, LOUISIANA & GULF.—Permission given this company to change its proposed route from Monticello, Ark., north to Pine Bluff, on the line building from Monroe, La., north to Pine Bluff, Ark., 136 miles, of which the first 56 miles from Monroe are now in operation. A branch is also in operation from Rolfe Junction, Ark., west 5 miles to Crossett, on the Chicago, Rock Island & Pacific. (July 17, p. 553.)

ATLANTA, BIRMINGHAM & ATLANTIC.—Official announcement has been made in Birmingham, Ala., that the first regular scheduled train will reach that place on Sunday, Sept. 6, after which regular service will be maintained to Atlanta and to the Atlantic coast at Brunswick. (Aug. 14, p. 740.)

AUGUSTA & EDGERFIELD (ELECTRIC).—W. P. Calhoun, Chairman, Edgerfield, S. C., writes that contracts for grading, track-laying, bridges, etc., are to be let as soon as the surveys are complete and the officers of the company elected. The permanent organization of the company will probably be effected inside of 30 days. There will be two bridges on the line. (Aug. 21, p. 787.)

CANADIAN PACIFIC.—The double-tracking work from Winnipeg, Man., to Fort William, Ont., 420 miles, will be all finished next month except on 25 miles. Work on the remaining section can be continued this coming winter. The company plans to have the line opened for traffic in time to carry this year's grain crop from the West to the head of the lakes. (June 26, p. 409.)

CHICAGO, MILWAUKEE & ST. PAUL.—Plans, it is said, will soon be filed at Olympia, Wash., for a branch line to serve the wheat sections of Waterville and Buckingham. The projected route is from the Pacific extension at the new town of Beverly, Wash., north on the east side of the Columbia river, about 120 miles.

COLORADO RAILWAY.—According to reports from Greeley, Colo., this company, operating a short line from a branch of the Colorado & Southern near Fort Collins, recently obtained a charter to build a number of lines in Colorado. The projected route of one is through Jefferson, Boulder, Larimer, Weld, Adams, Arapahoe, Douglas, El Paso, Pueblo, Huerfano and Las Animas counties. The plans also include a line from Denver north via Lafayette and Canfield to Fort Collins, 65 miles. It is said that work will be begun soon.

COLORADO SOUTHERN, NEW ORLEANS & PACIFIC.—General Manager Elliott is quoted as having said that trains will be running into Baton Rouge, La., before the first day of January. (Aug. 21, p. 787.)

GRAND TRUNK PACIFIC.—The Canadian Railway Commission has approved the revised location of this line from Prince Rupert, B. C., easterly to mile 10.64.

It is said that steps are being taken to cancel the contract with the Reynolds Construction Co. for building 150 miles of the Abitibi section of the National Transcontinental. The contract for construction was let to the Grand Trunk Pacific, which sublet to the Reynolds company. A good deal of preliminary work has been done by the latter, but it has failed to make adequate progress with the roadway. The National Transcontinental Railway Commission recently served notice on the Grand Trunk Pacific that 3,500 men would have to be put on the work in September or the contract would be taken off their hands, and the Commission would do the work itself, while the \$200,000 guarantee of the Grand Trunk Pacific would be confiscated.

HOUGHTON COUNTY STREET RAILWAY.—This company, with headquarters at Houghton, Mich., has given a contract to the Stone & Webster Engineering Co., Boston, Mass., for an extension from the present northern terminus to Mohawk, Mich.

The contract includes the construction of track, bridges, car barn, overhead work, sub-station and new rolling stock. The cost will be about \$125,000.

HUDSON & MANHATTAN.—Officers of this company expect that all of its tunnels between New York and New Jersey will be completed and in operation by January, 1909. On the Manhattan side, it is said that the work will be finished within 90 days. The tunnel in Sixth avenue, Manhattan, is finished to Twenty-seventh street, and from that point to Thirty-third street, the northern terminus, the excavation work will be done in a short time. The south tubes between Cortlandt street terminal and Jersey City are finished under the river, and the work of concreting and laying the tracks under Cortlandt and Fulton streets, Manhattan, is progressing at the rate of 12 ft. a day. On the New Jersey side less than a half a mile of tunnel remains to be built between Hoboken and Jersey City. (June 19, p. 209.)

IDAHO RAILWAY & NAVIGATION.—The plans for this company provide for the construction of a line from Lewiston, Idaho, to the upper Snake river country to tap a coal and timber section, and it is expected that grading will begin in a few weeks. The company will also operate a line of small steamers on the upper Snake river to handle freight and passenger business, pending the completion of the road and to serve the construction camps. The offices of the company are in the Hyde block, Spokane, Wash.

IOWA & OMAHA SHORT LINE.—Preliminary surveys are reported made and rights of way secured by this company, recently organized in Iowa with \$1,000,000 capital to build from Omaha, Neb., east to Des Moines, Iowa, 125 miles. The projected route is from Omaha east via Council Bluffs, Iowa; Treynor, Carson, Oakland, Walnut, Elkhorn, Exira, Panora and Dallas Center to Des Moines. G. W. Adams, President, Walnut; C. L. Kirkwood, Vice-President, North Branch; A. L. Ingram, Treasurer, and P. Kathmann, Secretary, both of Treynor.

KANSAS CITY, MEXICO & ORIENT.—An officer of this road denies the report, published in these columns last week, that A. E. Stilwell, President of the company, has raised nearly \$2,000,000 in London to be used in construction work in Mexico and Texas. Mr. Stilwell is in London, and it is expected that a large amount of money will be secured in September.

LARAMIE, HAHN'S PEAK & PACIFIC.—A contract has been let to the Bradbury Construction Co. and J. P. Juett, of Pueblo, Colo., for grading ten miles of the Walden extension, the work to be completed this year. This will complete the road to within 35 miles of Walden, Colo., and 55 miles from Laramie, Wyo. (July 19, p. 83.)

MISSOURI, ARKANSAS & SOUTHWESTERN.—An extension of 18 months has been granted this company to finish the required 10 per cent. of line. The plans call for a line from Batesville, Ark., northeast to Black Rock, 40 miles. The promoters say they will have the required amount finished in time. R. W. Earnheart, President, Batesville.

MONROE, FARMERSVILLE & HOPE.—Preliminary surveys from Monroe, La., northwest to Texarkana, Ark., are said to have been completed. The promoters of this line are credited with having made the statement that arrangements have been made with New York capitalists for financing the road, and that the contracts for grading will be let within a few days. It is probable that part of the road will be built along the right of way formerly surveyed for the Louisiana & Northwestern line, part of the grade for the new line being built before that project was abandoned.

MOUNTAIN VALLEY & PLAINS.—Organized by New Mexico and Ohio capitalists to build a line from Cimarron, N. Mex., through Amistad and Central City to Nara Visa. The work of grading will begin soon. The company is capitalized at \$3,000,000, of which \$130,000 has been subscribed. The incorporators are: Jay M. Cogan, Canton, Ohio; Del W. Herrington, Dalhart, Tex.; Charles J. Bushnell, Beecham, N. Y.; C. A. Macy, M. Weimer, Charles Cogan, W. A. Schuler, J. E. Buskirk, Ben O. Boyce, L. D. Chambers and H. S. Wallamaker, all of Amistad; J. S. Holland, Holland, N. Mex. The offices of the company will be at Amistad.

NEZ PERCE & IDAHO (ELECTRIC).—The construction forces are being increased in order to insure the completion of the grading this fall. The company has recently ordered 35,000 red fir ties from the Coast Lumber Co. for delivery commencing October 1. An order has also been given for the lumber and bridge material needed in construction work, the delivery of the latter having already commenced. (July 10, p. 505.)

NORTH COAST.—President R. E. Strahorn is said to have made a statement to the effect that this company has purchased in North Yakima, Wash., and immediate vicinity, during the past two weeks, a right of way costing \$30,000. By franchises which have been given this road, the line is to be built into North Yakima within two years. (Aug. 14, p. 741.)

NORTHERN PACIFIC.—This company has filed plans in the land office at Miles City, Mont., for the construction of a line from Mandan, N. D., to Glendive, Mont., by way of Buford, S. Dak., about 300 miles. This company has a direct line from Mandan to Glendive, and the proposed loop is for the purpose of developing the new lands of the Lower Yellowstone irrigation project, comprising about 66,000 acres of agricultural land, which at the present time is served only by a stage line.

OCEAN SHORE.—An officer writes that this road is for the present using steam for motive power on the 44 miles of main track now in operation from San Francisco, Cal., south to Grenada, 27½ miles on the north end, and from Santa Cruz north to Folger, 16½ miles on the south end. The completed road is to run from San Francisco south along the Pacific coast via Half Moon Bay, San Gregorio, Pescadero and Davenport to Santa Cruz. The whole road is to be operated by electricity when it is finished. Work is now under way on the gap from Grenada south to Folger, 34 miles, for which contracts have been let as follows: Ransome Construction Co., Oakland, Cal., and Lilley & Heins, Santa Cruz, for the grading, and the Humboldt Contracting Co. for the bridging. There are 6 miles of heavy bluff work, ½ mile of bridging and 27½ miles of easy scraper work. The bridges include three frame trestles and two reinforced concrete viaducts. (August 14, p. 441.)

OREGON SHORT LINE.—Surveys are being made for a line from Twin Falls, Idaho, south to Wells, Nev. The proposed line will be about 90 miles long, and is to give the districts around Twin Falls an outlet to Nevada and California.

PAN AMERICAN.—Reports from Mexico City say that the Mexican government has paid the best installment of \$500,000 granted to this company for building 100 miles of railroad in Mexican territory.

QUANAH & EL PASO.—According to reports from Quanah, Tex., a contract has been given by the Commercial Club to J. L. Bell of the Kansas City & El Paso Construction Co. to build the first section of the proposed line. The projected route is from Quanah southwest via Paducah to Carlsbad, N. Mex., thence to El Paso, Tex., about 400 miles. Right of way and bonus for part of the line has already been secured, and work is to be started this year.

SIOUX CITY & SPIRIT LAKE.—Proposed line from Sioux City, Iowa, northeast to Spirit Lake, passing through Le Mars, Paullina, Primghar, Hartley and Hagerty. The city of Le Mars has recently subscribed \$30,000.

SOUTHERN PACIFIC (MEXICO).—E. A. McFarland, Chief Engineer of the Southern Pacific of Mexico, building the new line from Guaymas, Sinaloa, down the Pacific coast of Mexico to Guadalajara, Jalisco, 730 miles, is quoted as follows: The extension will be completed from Guaymas to the Santiago river in Tepic by this time next year. The crossing of the river will be made a short distance above Santiago Ixquintla. It is expected to have the line north from Orendain, the junction with the Mexican Central 25 miles from Guadalajara, to the Santo Tomas barranca, near the Jalisco-Tepic boundary, finished within a year. According to estimates it will require two years to build the extension through the barrancas. Before this work is finished the line from the Santiago river to the barrancas will be completed. This means that the entire extension should be ready for operation in about three years. The extension is now in operation as far south as Culiacan, Sinaloa, and through Pullmans are in service from

Culiacañ north to Tucson, Ariz. Grading south of Culiacañ has reached Quila, on the San Lorenzo river, and track has been laid for $6\frac{1}{2}$ miles. North of Mazatlan, Sinaloa, the roadbed has been completed for 32 miles, and track is laid on 25 miles. The contract calls for the completion of 44 miles of roadbed north of Mazatlan by November 1. South of Mazatlan the grading has been finished for $12\frac{1}{2}$ miles, and tracklaying for $9\frac{1}{2}$ miles. (July 24, p. 601.)

SUMPTER VALLEY.—Plans, it is said, are being made to build an extension from the southern terminus at Austin, Ore., south 50 miles to Harney county. The road is now in operation from Baker City, Ore., southwest to Austin, 62 miles.

WASHINGTON WATER POWER CO.—This road is interested in the building of a 20-mile standard gage line from Springdale, Wash., south to the junction of the Chamokane creek and the Spokane river. The Phoenix Mill, of Spokane, Wash., is also connected with the project, as it holds a considerable amount of timber land in that vicinity. It is said that work will begin within 30 days.

WESTERN CENTRAL (ELECTRIC).—Incorporated in Nebraska with \$250,000 capital to build from Holdredge, Neb., northeast to Kearney, 30 miles. Surveys are being made and right of way secured. The directors include: T. E. Brady, J. G. Burlingham, E. O. Carlson, C. Stanton and S. C. Nelson, all of Omaha.

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ALBUQUERQUE EASTERN.—It is said that this company has sold \$1,600,000 first mortgage bonds to a syndicate, including western bankers, and A. L. Richmond, Jr., President of the Mount Washington Savings & Trust Co., Pittsburgh, Pa.

ATCHISON, TOPEKA & SANTA FE.—Lee, Higginson & Co., Boston, Mass., are offering to take subscriptions for the recently issued Atchison, Topeka & Santa Fe transcontinental short line first lien 4 per cent. bonds of 1908-1958 at $94\frac{1}{2}$, yielding about 4.25 per cent. (Aug. 28, p. 840.)

CHICAGO SOUTHERN.—Myron G. Carpenter, receiver of the Southern Indiana has been appointed also receiver of the Chicago Southern. The Chicago Southern is in default on \$4,000,000 collateral 5 per cent. notes matured July 1, 1907. The holders of all except \$710,000 of these notes, had agreed to exchange their notes for an equal amount of first mortgage bonds and 25 per cent. bonus in common stock of the Southern Indiana. See Southern Indiana.

DETROIT, TOLEDO & IRENTON.—The \$867,000 5 per cent. collateral trust notes held as security for a loan by Rudolph Kleybolte & Co. have been sold at auction, selling as high as 70. An agreement has been reached between the two interests controlling the Detroit, Toledo & Ironton collateral trust notes, which are secured by the Ann Arbor stock. The Ramsey committee will be allowed to choose successors to the three directors of the Ann Arbor retiring at the annual meeting September 19. There are 11 directors on the Ann Arbor board. (July 24, 1908, p. 602; July 3, p. 458.)

IONE & EASTERN.—This road was sold under foreclosure on August 22 for \$225,000. Frank J. Solinsky bought it in the interest, it is thought, of Peterson & Erickson, the contractors who built the road. It runs from Ione, Cal., to Martell, 12 miles.

METROPOLITAN STREET RAILWAY.—The quarterly dividend of $2\frac{1}{4}$ per cent., due as rental August 1 on the capital stock (\$1,862,000 outstanding) of the Second Avenue Elevated Railway, New York, was not paid by the receivers of the Metropolitan Street Railway.

MEXICAN CENTRAL.—The balance, about \$15,000,000, of the \$33,000,000 5 per cent. collateral trust notes of 1906-1910, which were bought by a syndicate in June, 1906, have been sold. The syndicate has been extended to December 20 to sell the balance, \$3,400,000, of the \$6,000,000 consolidated mortgage 4 per cent. bonds of 1889-1911 underwritten at the same time as the notes.

NATIONAL RAILWAYS OF MEXICO.—William Salomon & Co., New York, are offering at par a block of the National Railways

of Mexico—Mexican Central collateral trust 5 per cent. notes. These notes are part of an authorized issue of \$35,000,000, of which there are now outstanding \$23,000,000, the National Railways of Mexico having purchased and retired \$10,000,000 of the notes. The notes were authorized to refund \$29,000,000 collateral trust notes and bonds of the Mexican Central maturing in 1907 and 1908. The new notes are secured by \$18,967,000 National Railways of Mexico prior lien 4 $\frac{1}{2}$ per cent. bonds; \$9,169,000 National Railways of Mexico general mortgage 4 per cent. bonds guaranteed principal and interest by the Mexican government; and by \$13,075,000 other securities.

NORFOLK & SOUTHERN.—The reorganization committee, George C. Clark, Chairman, has given out its plan for the formation of the new company which shall issue \$12,000,000 first mortgage 5 per cent. 50-year bonds, and \$16,000,000 stock, in place of the present stock and funded debt, amounting to \$37,500,000.

NORTHERN OHIO TRACTION & LIGHT.—Two quarterly dividends of one-quarter of 1 per cent. each, payable September 15 and December 15, 1908, have been declared on the \$8,938,900 stock. This reduces the annual rate from 2 per cent., paid since June 15, 1906, to 1 per cent.

PONTIAC, OXFORD & NORTHERN.—The foreclosure sale set for August 20 has been postponed to September 15. The upset price, \$700,000, remains unchanged. The road extends from Pontiac, Mich., to Caseville, 100 miles. (August 28, p. 840.)

ST. PAUL & DES MOINS.—Having taken over the property of the Des Moines, Iowa Falls & Northern, the St. Paul & Des Moines has filed a certificate of increase of capital stock from \$1,000,000 to \$2,500,000. (July 24, p. 602.)

SANTA CLARA INTERURBAN.—The Southern Pacific has bought control of the Santa Clara Interurban, which has about five miles of electric railway at Palo Alto, Cal., and has franchises to build from Santa Clara, Cal., to Palo Alto, about $17\frac{1}{2}$ miles.

SECOND AVENUE (New York).—See Metropolitan Street Railway.

SOUTHERN INDIANA.—The first mortgage bond holders' protective committee, George W. Young, Chairman, "having received satisfactory deposits under its call and offer to purchase coupons maturing August 1, 1908, gives notice that the time within which bonds may be deposited and coupons purchased is extended, subject to termination without further notice." Expenses of the committee are limited to 2 per cent. of bonds deposited, except in case of a reorganization plan, from which, however, any depositor may withdraw. (See Chicago Southern.)

SOUTHERN PACIFIC.—See Santa Clara Interurban.

UNION PACIFIC.—Stockholders will be asked at the annual meeting on October 13 to authorize a first lien and refunding mortgage dated June 1, 1908, securing \$200,000,000 bonds, of which \$100,000,000 are to be reserved for the refunding of the first mortgage railroad and land grant four per cent. bonds. Of the bonds to be secured by this mortgage, \$50,000,000 were recently offered for sale by Kuhn Loeb & Co., New York. On May 5, 1908, the stockholders of the Union Pacific authorized the issue of \$50,000,000 bonds. When negotiations were started with bankers for the sale of these bonds it was found that if the mortgage was changed so that besides being a first lien on 1,178 miles of main line it would be refunding and the lien extended to lines covered by the first mortgage, dated July 1, 1897, but junior to the first mortgage, a better price could be secured for the bonds. The bonds were therefore sold under this new arrangement and the stockholders are now asked to authorize a mortgage securing them in such a way as to fulfill the terms under which they were sold.

WABASH-PITTSBURGH TERMINAL.—A majority of \$30,000,000 outstanding first mortgage 4 per cent. bonds have been deposited under the terms of the bondholders' agreement with the first mortgage bondholders' committee. The bonds deposited do not include the \$6,600,000 owned by the Wabash and pledged under its two-year collateral notes due May 10, 1909